APPENDIX I

DRAWINGS AND PLANS

APPENDIX I, DRAWING I.1
NEW PROVIDENCE ISLAND

NOT TO SCALE

ALBANY

I.1 - SITE LOCATION MAP

DESIGNED	T.T.T.	REVISION	DWG NAME	Location
DRAWN	SS	08-21-05	SHEET	I.1
DATE	01-31-05	N/A	SCALE	N.T.S.
JOB NO.	0485	N/A		

SECTION- TOWNSHIP- RANGE-

Turrell & Associates, Inc.
Marine & Environmental Consulting
3584 Exchange Ave. Suite B. Naples, FL 34104-3732
Email: tuna@turrell-associates.com Phone: (239) 643-0166 Fax: (239) 643-6632

PROPERTY BOUNDARY

TOPOGRAPHIC ELEVATION (REFERENCED IN FEET ABOVE MSL)

0 300 600 1,200

SCALE IN FEET

ALBANY

L2 - TOPOGRAPHIC ELEVATIONS ON AERIAL

DESIGNED	T.T.T.	REVISION	DWG NAME	Elevations
DRAWN	SS	08-21-08	SHEET	L2
DATE	01-31-08	N/A	SCALE	1"=600'
JOB NO	0485	N/A		

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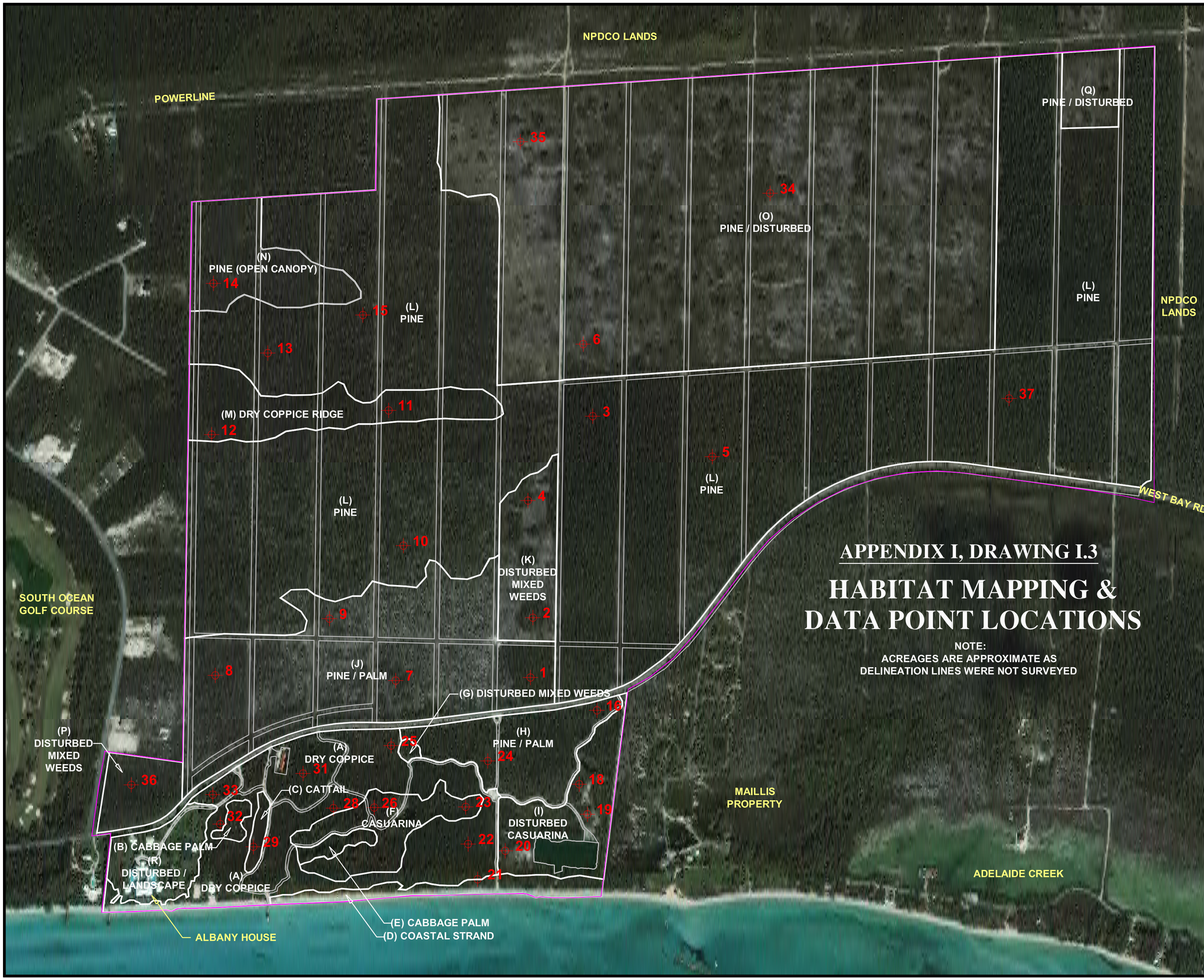


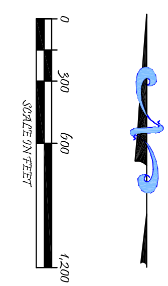
APPENDIX I, DRAWING I.3

HABITAT MAPPING & DATA POINT LOCATIONS

NOTE:
ACREAGES ARE APPROXIMATE AS DELINEATION LINES WERE NOT SURVEYED

HABITAT TYPE	*ACREAGE*
(A) DRY COPPICE	28.4
(B) CABBAGE PALM	0.9
(C) CATTAIL	1.0
(D) COASTAL STRAND	4.7
(E) CABBAGE PALM	1.2
(F) CASUARINA	7.5
(G) ORGANIC DEBRIS	0.4
(H) PINE / PALM	11.2
(I) DISTURBED CASUARINA	9.4
(J) PINE / PALM	38.4
(K) DISTURBED MIXED WEEDS	9.2
(L) PINE	231.3
(M) DRY COPPICE RIDGE	11.5
(N) PINE (OPEN CANOPY)	10.3
(O) PINE / DISTURBED	136.1
(P) DISTURBED MIXED WEEDS	5.1
(Q) PINE / DISTURBED	4.3
(R) DISTURBED / LANDSCAPE	6.5
ROADS	54.8
TOTALS	572.2

PROPERTY BOUNDARY
HABITAT DELINEATION
00 DATA POINT LOCATION
CLEARED TRAILS, ROADWAYS, OR WELL-FIELD TRENCHES



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ALBANY

I.3 - HABITAT MAP WITH DATA POINTS

DESIGNED	T.T.T.	REVISION	DWG NAME	Habitat
DRAWN	SS	08-21-05	SHEET	I.3
DATE	01-31-05	N/A	SCALE	1"=600'
JOB NO.	0485	N/A		

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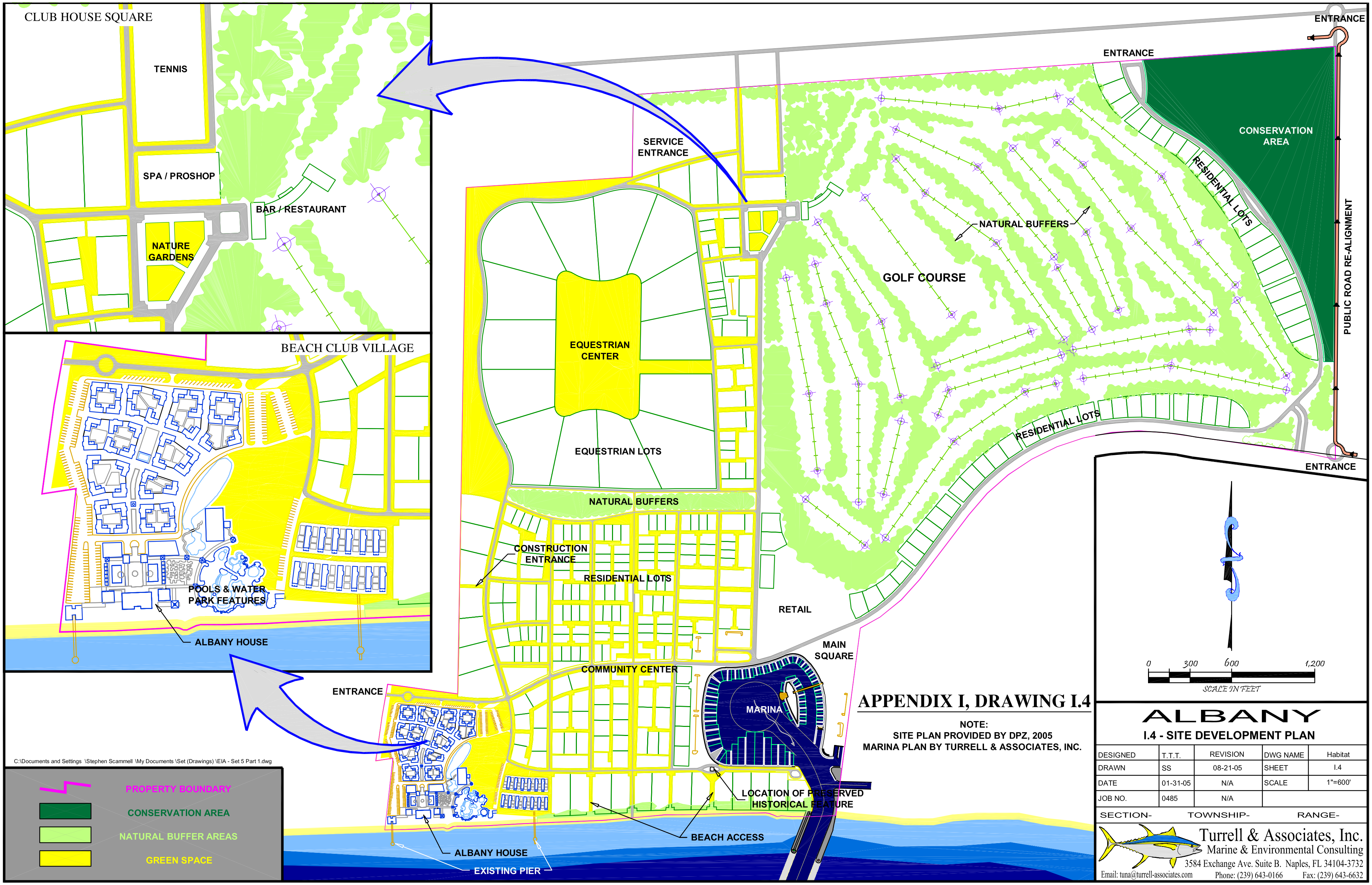
CLUB HOUSE SQUARE
TENNIS
SPA / PROSHOP
BAR / RESTAURANT
NATURE GARDENS
BEACH CLUB VILLAGE
POOLS & WATER PARK FEATURES
ALBANY HOUSE
SERVICE ENTRANCE
EQUESTRIAN CENTER
EQUESTRIAN LOTS
NATURAL BUFFERS
CONSTRUCTION ENTRANCE
RESIDENTIAL LOTS
COMMUNITY CENTER
RETAIL
MAIN SQUARE
MARINA
ENTRANCE
LOCATION OF PRESERVED HISTORICAL FEATURE
BEACH ACCESS
ALBANY HOUSE
EXISTING PIER
GOLF COURSE
NATURAL BUFFERS
RESIDENTIAL LOTS
RESIDENTIAL LOTS
CONSERVATION AREA
PUBLIC ROAD RE-ALIGNMENT
ENTRANCE
ENTRANCE
ENTRANCE
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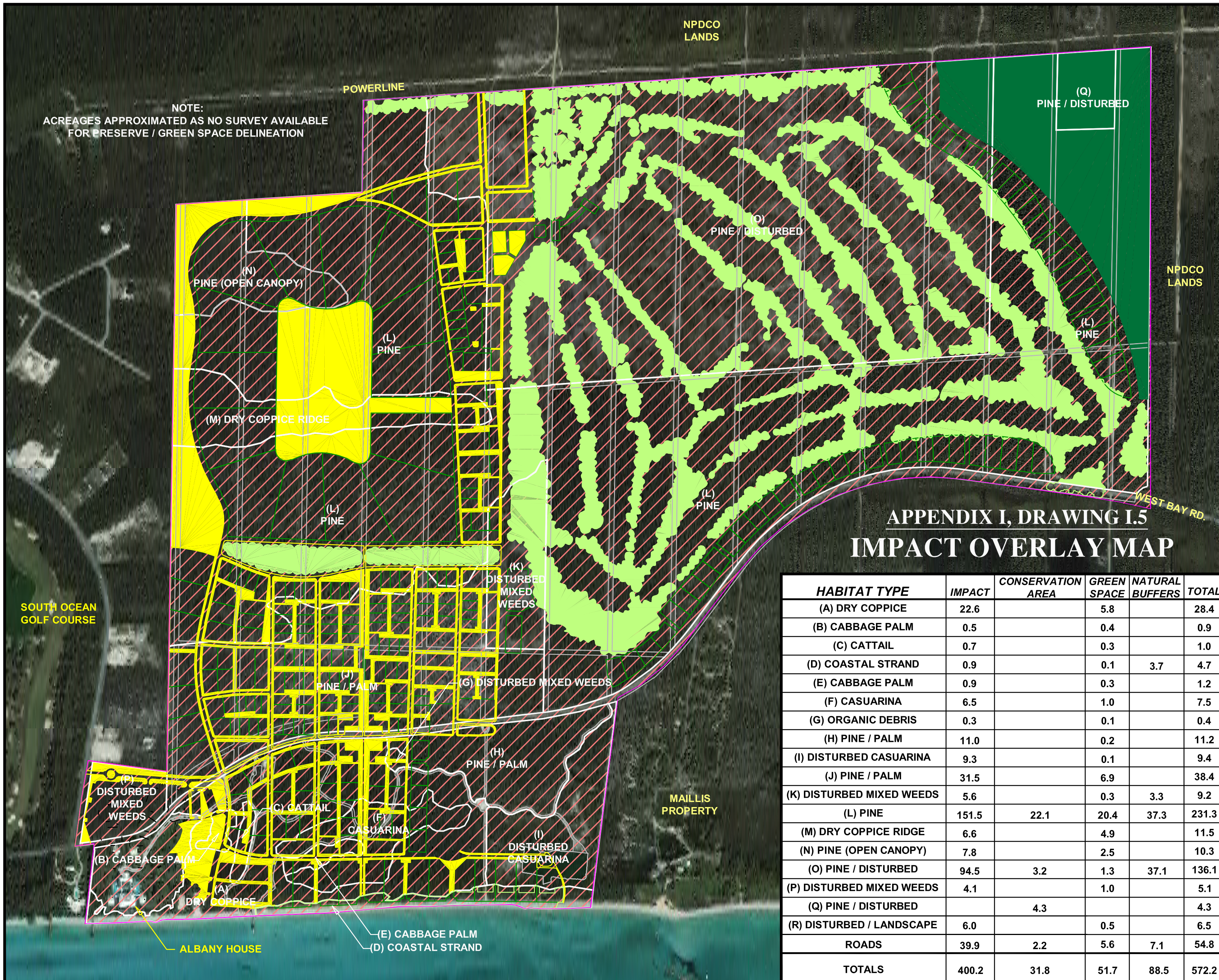
PROPERTY BOUNDARY
CONSERVATION AREA
NATURAL BUFFER AREAS
GREEN SPACE
APPENDIX I, DRAWING I.4
NOTE:
SITE PLAN PROVIDED BY DPZ, 2005
MARINA PLAN BY TURRELL & ASSOCIATES, INC.
0 300 600 1,200
SCALE IN FEET
ALBANY
I.4 - SITE DEVELOPMENT PLAN
DESIGNED T.T.T. REVISION DWG NAME Habitat
DRAWN SS 08-21-05 SHEET I.4
DATE 01-31-05 N/A SCALE 1"=600'
JOB NO. 0485 N/A
SECTION- TOWNSHIP- RANGE-
Turrell & Associates, Inc.
Marine & Environmental Consulting
3584 Exchange Ave. Suite B. Naples, FL 34104-3732
Email: tuna@turrell-associates.com Phone: (239) 643-0166 Fax: (239) 643-6632



APPENDIX I, DRAWING I.5

IMPACT OVERLAY MAP

HABITAT TYPE	IMPACT	CONSERVATION AREA	GREEN SPACE	NATURAL BUFFERS	TOTAL
(A) DRY COPPICE	22.6		5.8		28.4
(B) CABBAGE PALM	0.5		0.4		0.9
(C) CATTAIL	0.7		0.3		1.0
(D) COASTAL STRAND	0.9		0.1	3.7	4.7
(E) CABBAGE PALM	0.9		0.3		1.2
(F) CASUARINA	6.5		1.0		7.5
(G) ORGANIC DEBRIS	0.3		0.1		0.4
(H) PINE / PALM	11.0		0.2		11.2
(I) DISTURBED CASUARINA	9.3		0.1		9.4
(J) PINE / PALM	31.5		6.9		38.4
(K) DISTURBED MIXED WEEDS	5.6		0.3	3.3	9.2
(L) PINE	151.5	22.1	20.4	37.3	231.3
(M) DRY COPPICE RIDGE	6.6		4.9		11.5
(N) PINE (OPEN CANOPY)	7.8		2.5		10.3
(O) PINE / DISTURBED	94.5	3.2	1.3	37.1	136.1
(P) DISTURBED MIXED WEEDS	4.1		1.0		5.1
(Q) PINE / DISTURBED		4.3			4.3
(R) DISTURBED / LANDSCAPE	6.0		0.5		6.5
ROADS	39.9	2.2	5.6	7.1	54.8
TOTALS	400.2	31.8	51.7	88.5	572.2

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PROPERTY BOUNDARY
HABITAT DELINEATION
CONSERVATION AREA
CONSERVATION AREA
NATURAL BUFFER AREAS
GREEN SPACE

0 300 600 1,200
SCALE IN FEET

ALBANY

I.5 - IMPACTS MAP

DESIGNED	T.T.T.	REVISION		DWG NAME	Habitat
DRAWN	SS	08-21-05		SHEET	I.5
DATE	01-31-05	N/A		SCALE	1"=600'
JOB NO.	0485	N/A			

SECTION- TOWNSHIP- RANGE-

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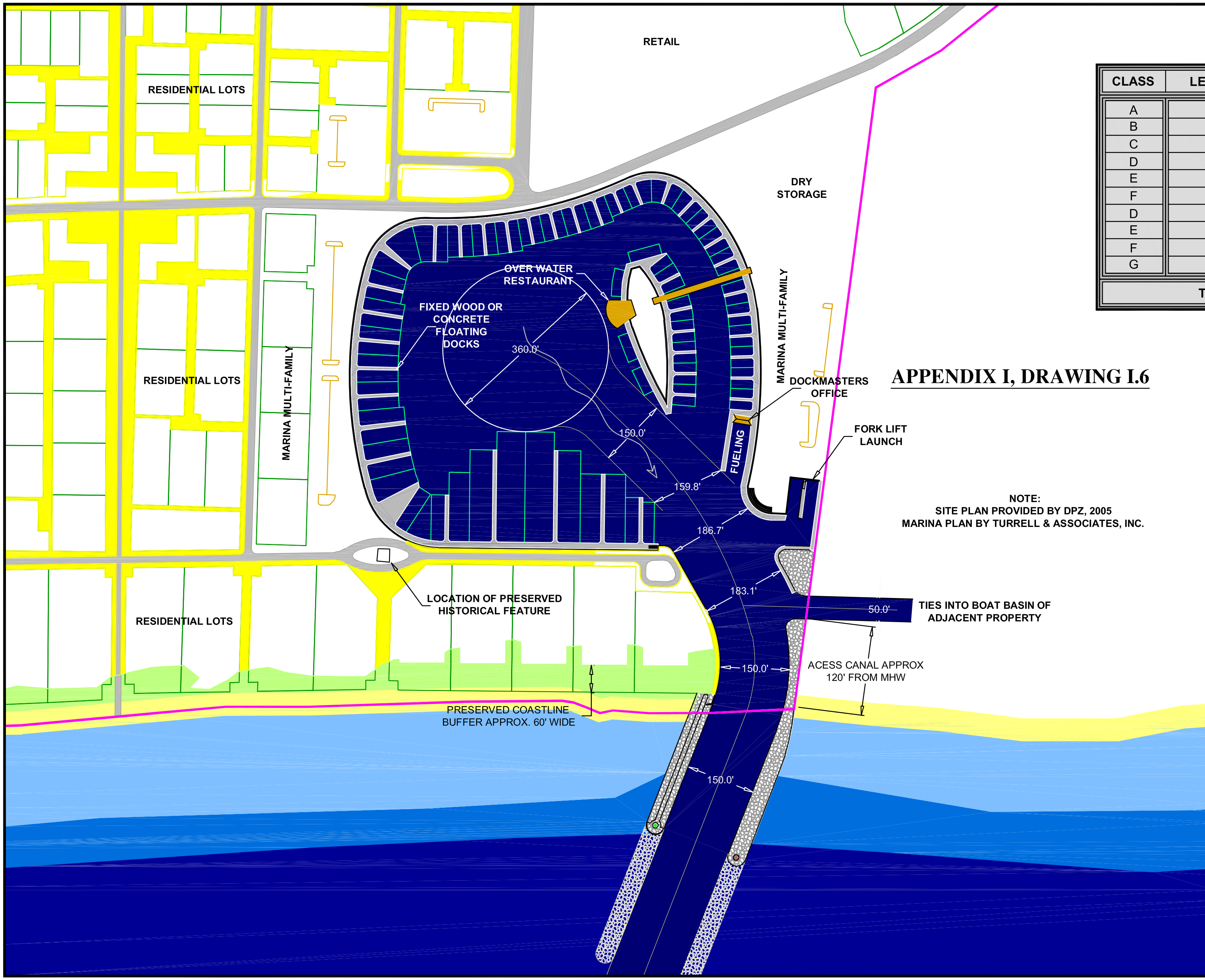
3584 Exchange Ave. Suite B. Naples, FL 34104-3732
Email: tuna@turrell-associates.com Phone: (239) 643-0166 Fax: (239) 643-6632

APPENDIX I, DRAWING I.6



CLASS	LENGTH	MAX BEAM	SLIPS
A	40	17.5	31
B	50	19.5	20
C	60	20.5	14
D	70	22.5	3
E	80	23.0	3
F	90	24.5	4
D	100	29.5	8
E	150	44.5	3
F	200	49.5	1
G	240	54.5	3
TOTAL SLIPS			90

C:\Documents and Settings \Stephen Scammell \My Documents \Set (Drawings) \EIA - Set 5 Part 1.dwg

PROPERTY BOUNDARY
CONSERVATION AREA
NATURAL BUFFER AREAS
GREEN SPACE

NOTE:
SITE PLAN PROVIDED BY DPZ, 2005
MARINA PLAN BY TURRELL & ASSOCIATES, INC.

0 100 200 400
SCALE IN FEET

ALBANY

I.6 - MARINA BASIN PLAN VIEW

DESIGNED	T.T.T.	REVISION	DWG NAME	Habitat
DRAWN	SS	08-21-05	SHEET	I.6
DATE	01-31-05	N/A	SCALE	1"=200'
JOB NO.	0485	N/A		

SECTION- TOWNSHIP- RANGE-

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Marine & Environmental Consulting
3584 Exchange Ave. Suite B. Naples, FL 34104-3732
Email: tuna@turrell-associates.com Phone: (239) 643-0166 Fax: (239) 643-6632

APPENDIX II

COASTAL IMPACTS ANALYSIS
SMITH WARNER INTERNATIONAL

Coastal Environmental Impact Assessment & Conceptual Design

for the

Albany Development, New Providence, The Bahamas

Submitted to

Ridgefield Holdings Ltd.

by

SMITH WARNER INTERNATIONAL
COASTAL & ENVIRONMENTAL ENGINEERING

5 August 2005

Table of Contents

Table of Figures

1. Background

Park Ridge Securities Corp. is seeking to construct a marina as an integral component of the Albany development proposed for the southwest coast of New Providence Island, The Bahamas (Figure 1.1).

Figure 1.1 Location of the Albany Development (New Providence, Bahamas)

The developers are committed to an environmentally responsible development, and are interested in defining any potential short and long-term environmental impacts associated with the construction of, and access to the marina. As part of the overall Environmental Impact Assessment (EIA), *Smith Warner International Ltd. (SWIL)* was commissioned to undertake a coastal environmental impact assessment of the proposed marine works linked with the anticipated development and to formulate the conceptual design for the marina entrance channel. The study was carried out in a joint venture with the rest of the environmental scientists and engineers participating in the general EIA. This document represents a summary of the findings of the commissioned *Coastal Environmental Impact Assessment and Conceptual Design Study*, conducted between April and July 2005.

2. Study Objectives

The Master Plan for the project includes the development of a private marina facility at the eastern boundary of the property. The area of the proposed marina basin is about 60,000 m^2 (15 acres). The marina is proposed to accommodate mega yachts of up to 73 m (240 ft) in length. A 45 m (150 ft) wide entrance channel has been proposed to provide access to the marina. In addition, the entrance channel is to give access to the neighbour's basin located on the east side of the Albany property.

The entrance channel is to be bounded by two inlet jetties to separate the channel from the beach and to avoid rapid sedimentation within the channel. The channel is to extend out to sea and has to maintain a proposed depth of up to 18 ft to accommodate the mega yachts.

These aspects of the Master Plan represent significant changes to the coastal landscape of the area. Recognizing the value of the beaches, dunes and other natural resources of the area, this study was commissioned with the following objectives:

- To identify the requisite length, depth and orientation of the proposed entrance channel;
- To assess the littoral trends in the vicinity of the project site;
- To determine the anticipated rates of channel shoaling;
- To identify the requisite length and orientation of the proposed inlet jetties;
- To determine the possible requisite dredge quantities;
- To determine the water circulation patterns and associated water quality in the proposed marina;
- To assess any possible environmental impacts associated with the construction of the marina inlet and channel; and
- To recommend suitable mitigation actions to address any potential negative environmental impacts.

3. Investigations Carried Out

In the conduct of the Coastal EIA and the Conceptual Design of the marina entrance channel a number of investigations were carried out. These included:

- Field data collection, including a bathymetric survey, shoreline mapping, drogue tracking, a benthic assessment, the deployment of a current meter, and the installation of a tidal gauge;
- Determination of operational (day-to-day) and hurricane (extreme) wave climates;
- Analyses of sediment transport processes;
- Determination of current circulation patterns;
- Hydrodynamic and water quality modelling for the marina;
- Evaluation of options for the conceptual design of the marina entrance channel; and
- Assessment of impacts of channel and inlet construction on the shoreline.

It should be noted that the instruments that were deployed to collect the tide and current data used in this study were re-deployed and are currently collecting additional data. It is proposed that this data be used in the final design phase of the project.

4. Physical Characteristics of the Marine Environment

4.1 Project Shoreline Morphology

The proposed Albany Development is located on the southwest shoreline of New Providence, between Clifton Point (west) and Adelaide (east). The project shoreline is just over 1000 m (3281 ft) in length and is oriented in an east to west direction. The coastline is characterized generally by a narrow sandy beach between Stuart Coves and Adelaide. This stretch of shoreline has reportedly undergone erosion during the passage of recent hurricanes but has shown signs of natural recovery.

The coastline along the Albany Development is a relatively steep, narrow, sandy shore, backed by a well-vegetated dune (Figure 4.1). The site's robust dune vegetation grows out to almost the high water mark. This dune vegetation cover is not consistent along the entire coastline. On the west side, at the South Ocean Beach hotel development, the dune vegetation was completely removed and replaced with seawalls. Along this shoreline, the beach is at its narrowest. On the eastern side, there has been some vegetation clearing along the Adelaide beach. The beach in this area is also narrower than along the Albany shoreline.

Another key feature of the shoreline includes an artificial reef structure some 130 m (427 ft) offshore Albany's eastern property boundary. This has caused a seaward protrusion of the shoreline as a result of accretion of sand behind that structure.

Figure 4.1 View towards the east and west along the shoreline of the Albany Development

4.2 Seabed Bathymetry

The nearshore and offshore seabed bathymetry was defined by compiling the results of a bathymetric survey, a topographic shoreline survey along with marine chart data. The resulting contour plot, overlain on a 2000 satellite image, is shown following in Figure 4.2

The figure shows that the seafloor adjacent to the project site is relatively shallow. The nearshore area is characterized by rows of sand bars that extend out to some 200 m (656 ft) from shore. These bars indicate the zone within which there is active sand movement. The formation of the bars is produced by the seasonal differences in the nearshore wave climate.

Figure 4.2 Bathymetry offshore the Albany Development (depth contours in m, relative to MSL)

The continental shelf is closest to land at Clifton Point, where it is less than 600 m (1968 ft) away from the shoreline. The shelf has a southeast to northwest orientation and, as such, is some 5 km (3 miles) due south of Albany. The seabed slopes gently between the shoreline and the continental shelf. The 5 m (16.4 ft) contour is some 3 km (2.9 miles) due south of Albany and is some 2 km (1.2 miles) due southwest of Albany.

It should be noted that the orientation of the continental shelf and the shallow nature of the nearshore will have several implications for the project. These are as follows:

- Incoming wave heights, especially from storms, are significantly reduced as they cross the continental shelf, therefore minimizing storm damage to the shoreline.
- The presence of the sand bars will influence the determination of the minimum requisite length of the inlet structures of the entrance channel.
- Dredging will be required to create a channel up to the marina entrance.
- The channel should be aligned along a southwest orientation so as to reduce the required length.

5. Entrance Channel and Marina Basin Conceptual Design

The conceptual marina design has been developed by Turrell & Associates. The concept design is shown in Figure 5.1. The marina has been designed for approximately 90 slips holding yachts from 9 to 73 m (30 to 240 ft) in length, with beams of 4.5 to 17 m (15 to 55 ft). A width of 46 m (150 ft) has been proposed for the access channel to the marina basin. Two inlet jetties of length 95 m (310 ft) have been proposed to separate the channel from the beach. Turrell & Associates have suggested a minimum depth of up to 5.5 m (18 ft) in the entrance channel.

The proposed marina basin design and dimensions for the depth and width of the entrance channel, as well as the channel alignment and the length of the inlet jetties, were further studied in conjunction with the bathymetry of the area.

Regarding the current marina basin design, it should be noted that the presence of rounded corners eliminates the stagnation effects that sharp-edged corners would have on the water circulation inside the basin. This exploits the natural hydraulic patterns of flow and prevents the occurrence of areas where flushing is minimal. Additionally, the design of the marina basin should consider a gradual increase in depth towards the entrance channel and open water in order to promote faster flushing as a result of the gradient in the bathymetry. Otherwise, isolated deep holes where water can stagnate may be created. As such, it is proposed to gradually increase the basin depth from the northern part of the basin to its southern side. For an assumed maximum depth inside the basin of 5.5 m (18 ft), the estimated volume of material (mostly rock) that will need to be dredged for the marina construction is approximately 320,000 m^3 (420,000 yd^3).

The alignment of the access channel was chosen so as to minimize the amount of dredging that would be required and to limit the impact to the coral heads, taking into consideration the navigability of the channel under the predominant wave directions. As such, it is proposed to orient the access channel towards the southwest direction in order to reach the 5 m depth contour over the shortest possible distance. Figure 5.2 below shows the orientation initially proposed for the jetties and entrance channel.

With respect to the width of the entrance channel, general standards suggest a minimum width of 30 m (100 ft). Taking into account the type of boats accessing the marina and the relatively high waves that sometimes are generated in the access channel area (as will be seen later in the wave climate study), the width of the channel is proposed to vary from 46 m (150 ft) to 65 m (200 ft), in order to facilitate safe navigation along the channel. Taking into consideration the proposed dimensions of the channel, the initial amount that will need to be dredged for its construction is approximately 315,000 m^3 (412,000 yd^3). In order to quantify how much of this material will be rock or sand, it is recommended to make field measurements of depth-to-rock below the ambient seabed (along the proposed channel alignment) using a jet probe. This information would also give an idea of the available amount of sand for beach nourishment campaigns. If a 1 m (3.3 ft) depth of sand is assumed, the estimated volume of sand to be dredged would be in the order of approximately 150,000 m^3 (164,000 yd^3).

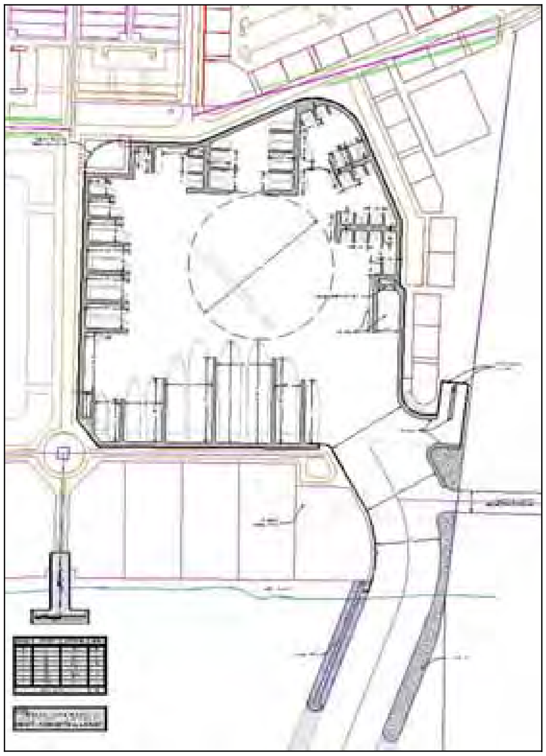


Figure 5.1 Concept Design for Marina

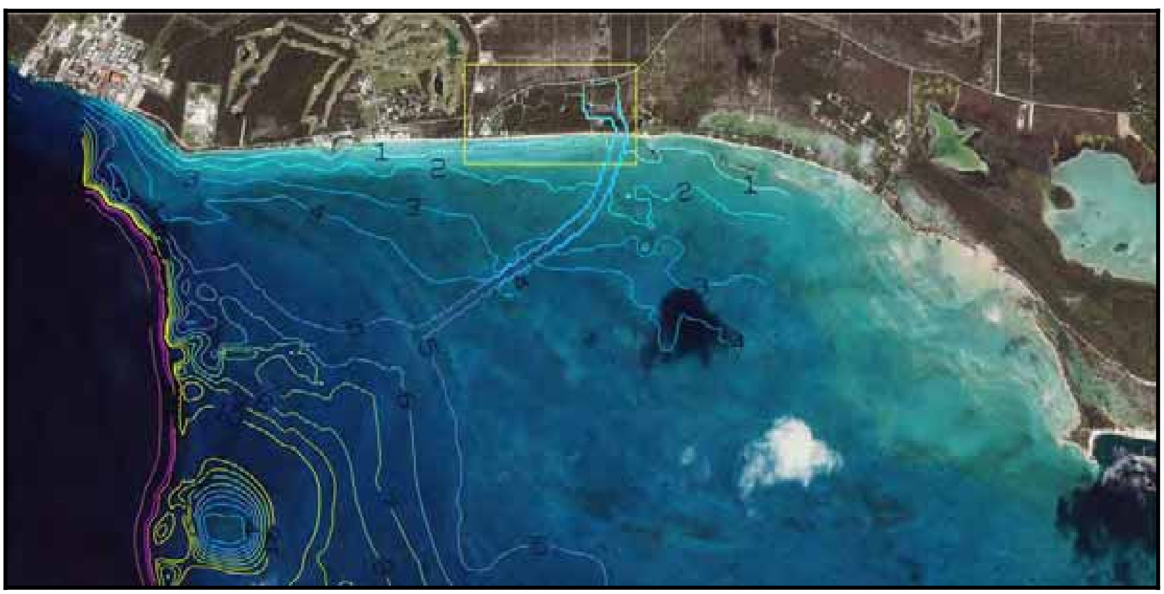


Figure 5.2 Alignment of marina access channel

Given the wave climate and movements of sand within the area (as will be seen later in the following sections), it is proposed to extend the inlet jetties some 175 and 300 m (575 and 985 ft) offshore from the marina entrance. For marina sheltering purposes, the first part of the jetties is proposed to have the crest height at +3.00 m (9.8 ft) above MSL. These are approximately 100 m (328 ft) and 180 m (590 ft) in length. For sediment transport purposes and in order to minimize the visual impact of the structures, the seaward ends of the jetties are proposed to be low-crested breakwaters with the crest height just above HWM, +1.50 m (4.9 ft) above MSL. These extend beyond the nearshore zone within which sediment movement occurs. The eastern jetty is to extend further offshore than the western jetty so as to reduce the wave penetration into the entrance from the predominant easterly waves. The low-crested portion of the eastern jetty is 120 m (394) and for the western jetty it is 75 m (246 ft). These low-crested portions of the jetties should be appropriately marked by pilings.

Additionally, for beach stabilization purposes and to dissuade rip currents and navigation channel shoaling at the jetty ends, the use of rock spurs is recommended on the beach sides of each jetty. It is proposed to make these spurs at least 20 m (66 ft) long and to locate them at a distance of at least 20 m (66 ft) seaward from the mean shoreline.

The details of the final proposed channel plan view and cross-sections, as well as the details of the inlet jetties and rock spurs, are shown in Appendix I 'Drawings'.

6. Benthic Environment

A qualitative assessment of the seafloor in the vicinity of the proposed development and, specifically, the entrance channel and marina inlet was conducted in order to:

- determine the composition of the seafloor in the area;
- determine the presence or absence of particularly sensitive marine species;
- identify any potential impacts from the proposed development; and
- guide the conceptual design of the entrance channel and marina inlet.

The qualitative assessment was conducted through extensive observations made from a boat and snorkelling in select areas. Given the clarity of the water, the shallow nature of the area, and the vast seafloor to be considered, the use of a slow-moving boat was deemed appropriate for observation of the composition of the seafloor in some areas. Snorkelling was used to make observations in areas of apparent importance. Specific attention was given to the location of the proposed inlet structures and the proposed channel orientation.

The seafloor in the vicinity of the project site is typical of the shallow tropical waters of The Bahamas. It is dominated by sandy bottom, interspersed with patches of coral, macroalgae, very small and sparse seagrass beds, and sponges.

Figure 6.1 Photos of the typical seafloor in the area (top) and the patch reef (bottom)

A few healthy relatively large coral heads were observed in the vicinity of the project site during the field investigation, and a small rubble patch reef was noted just offshore of the eastern end of the study area. As mentioned in the previous section, the location of these coral heads was taken into account in the design of the access channel alignment, in an attempt to protect them as much as possible. Corals seen include sea rods, brain corals, encrusting corals, and boulder corals (as described in the species list in Table 6.1 below). Of interest, one of the healthy coral heads (shown in Figure 6.1) is located approximately 500 m (1640 ft) offshore in the vicinity of the proposed entrance channel.

Associated with these sedentary species are several mobile species. Common species found in/atop the sandy substrate include sea biscuits, sand dollars and rays. Also prevalent was the brown algae, Sargassum. The fish species observed include mostly adult parrot fish, damselfish, wrasse, rays and barracuda. Nurse and reef sharks are also reported to frequent the area. These species are sensitive to increased turbidity & sedimentation. It will therefore be necessary to limit the turbidity and sedimentation associated with the construction of the channel and inlet jetties. Consideration will also have to be given to possible relocation of the coral heads in the case that they are located within the proposed channel alignment.

Typical of many areas in the Bahamas, and therefore notably absent from the seafloor in the area considered, are the commercially important species of conch and lobster. Relative to other banks of the Bahamas, this location is not noted to be of commercial or ecological importance for these species. There is limited information available on the conch and lobster populations along the southwest coast of New Providence, further suggesting that these species are not common to this area.

Overall, the seafloor in the area is relatively undisturbed, although just offshore of the site considered, approaching the edge of the continental shelf, several 'dive sites' have been created through the intentional sinking of derelict vessels. These sites are used regularly by the dive operators in the area for commercial (tourism) purposes. The wall itself is reportedly an area of substantial marine life, with corals, sponges, reef fish, rays, barracudas and sharks. Figure 6.2 shows the proposed channel alignment and the location of the different diving sites in the area. As can be observed in this figure, these sites are located at depths greater than 7 m (23 ft) and are all relatively far away from the location of the access channel.

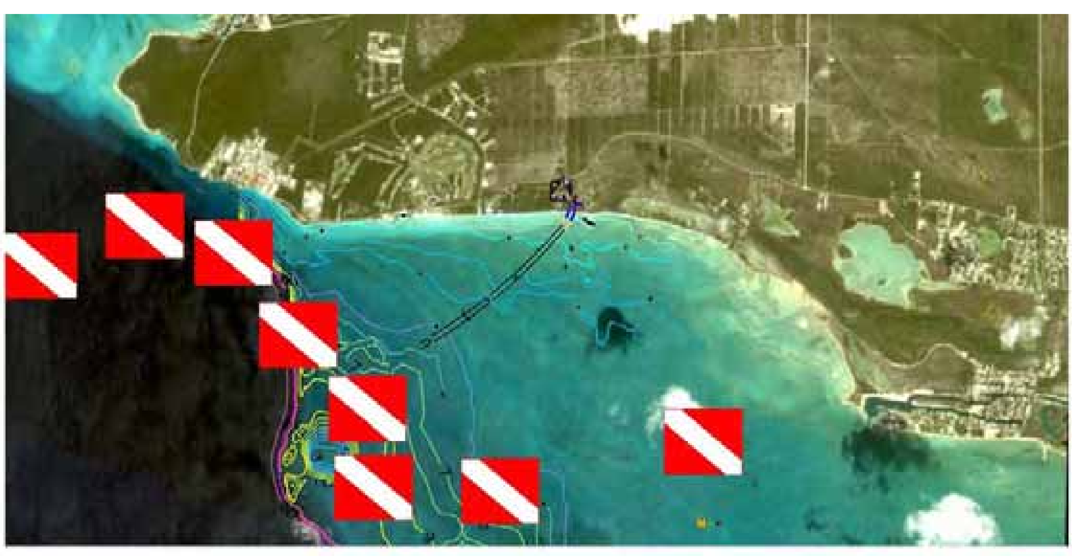


Figure 6.2 Major Dive Sites in the immediate area

Table 6.1 List of observed Species in the area

Scientific Name	***Common Name***
Corals	
Pseudoplexaura sp.	Porous Sea Rod
Porites porites	Finger Coral
Porites astreoides	Mustard hill coral
Siderastrea siderea	Massive Starlet Coral
Diploria sp.	Brain coral
Plexaurella sp.	Split-pore sea rod
Fish	
Scarus coeruleus	Blue Parrotfish
Lutjanus sp. (Juvenile)	Snapper
Haemulon sp. (Intermediate)	Grunt
Thalassoma bifasciatum (Adult & Intermediate)	Bluehead wrasse
Chaetodon ocellatus	Spotfin butterflyfish
Dasyatis sp.	Stingray
Sphyaena barracuda	Barracuda
Other Fauna	
Spheciospongia vesparium	Loggerhead sponge
Tedania ignis	Fire sponge
Mellita sp.	Keyhole sand dollar
Encope sp.	Sand dollar
Algae	
Sargassum sp.	
Avrainvillea sp.	
Dasycladus sp.	
Penicillus sp.	
Seagrass	
Thalassia testudinum	Turtle grass

7. Operational Wave Climate

Waves are the main driving force of sediment movement in the nearshore zone of Albany. Additionally, a marina, particularly its entrance channel, must be designed so as to be reasonably sheltered against wave action. As such, in order to assess how the channel and the sediment movement will impact each other, and to determine the wave penetration into the marina basin, the wave climate must be first understood.

The operational wave climate at the project site was obtained by simulating the wind and wave conditions across the shelf south and southeast of New Providence and up to the project site. The wave transformation was done using SWAN (Simulating WAves Nearshore), a third-generation wave model that computes random, short-crested wind-generated waves in coastal regions and inland waters.

The directional distribution of the wind data used in the simulation is shown in the Figure 7.1 below.

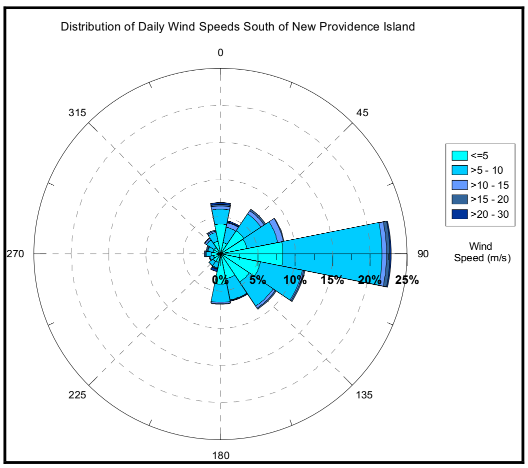


Figure 7.1 Directional distribution of wind speeds South of New Providence island (Source: Alkyon Hydrobase of Ship Observations)

The figure indicates that the prevailing winds are coming from the east (over 22% of the time). Taking into account that the project site is located on the south-western side of New Providence, the site will mostly be exposed to wind-generated waves coming from the sectors between east and south. The winds with a 1% and 5% chance of exceedance (occurring annually for 3.65 days and 18.25 days, respectively) were simulated in SWAN. The wave simulation was done using winds from 5 sectors (east, east-southeast, southeast, south-southeast and south). This means that a total of 10 simulations were carried out. Figure 7.2 illustrates the results of two of these simulations. The two-dimensional wave field is shown in these figures.

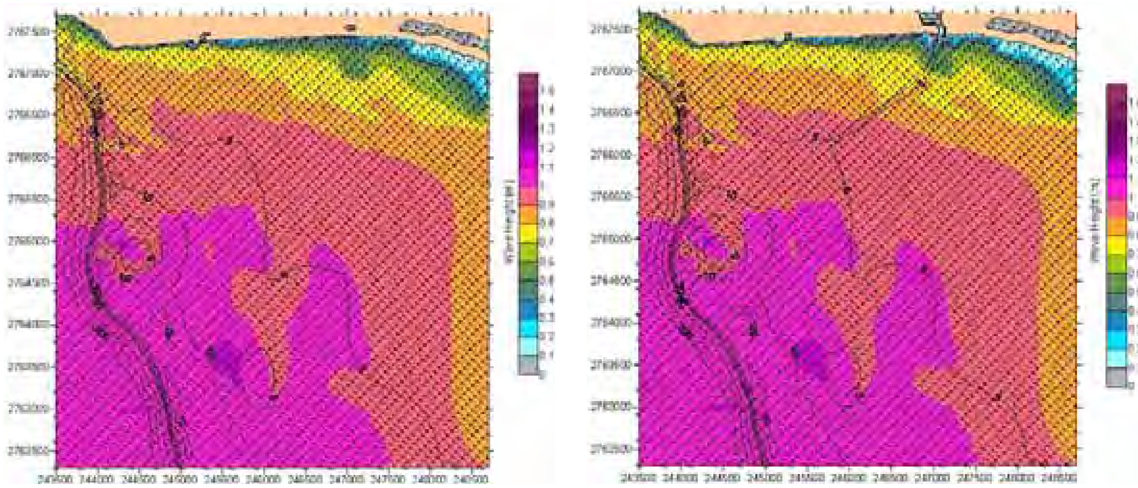


Figure 7.2 Two-dimensional plots of 1% exceedance wind-waves coming from the east (with and without entrance structures)

The results of the simulations demonstrate a number of points, some of which are borne out in the plots above. These are listed following:

- Waves approach Albany and the adjacent shorelines almost always from a south easterly direction under daily conditions. This implies that, under daily conditions, sediment movement is going to be predominantly from east to west;
- Waves are most frequent and are highest from the east and the east-southeast directions;
- Because of a shallower nearshore, the wave heights at Adelaide are slightly lower than at Albany.
- There are minimal changes to the nearshore wave patterns between the existing and the proposed situation. Significant changes are only noted within the vicinity of the jetties. While the structures prevent any significant penetration of waves into the marina, they reflect waves that end up dissipating on the beach, particularly on the eastern side of the entrance channel. This would normally be expected to cause erosion on the eastern side of the channel. However, this erosion will be negated by the expected build-up of sand against the structure. Furthermore, the presence of the rock spurs will reduce the erosive impact of those incoming waves.
- The wave heights at the channel entrance can reach values of up to 1 m. Inside the access channel, these wave heights can still be relatively high (0.8 m close to the channel entrance, decreasing to approximately 0.4 m at the marina entrance).

In addition to the daily wind-generated waves, during the winter months (December to April), low-pressure storm systems off the eastern seaboard of North America generate waves that reach the project site as swell waves. These waves would generally approach the site from a west and northwest direction. These waves are low, long-period waves that, upon reaching shallow water, can increase dramatically in height. These swell conditions were also simulated for the project site. Figure 7.3 shows sample plots of the wave patterns for the existing and proposed scenarios.

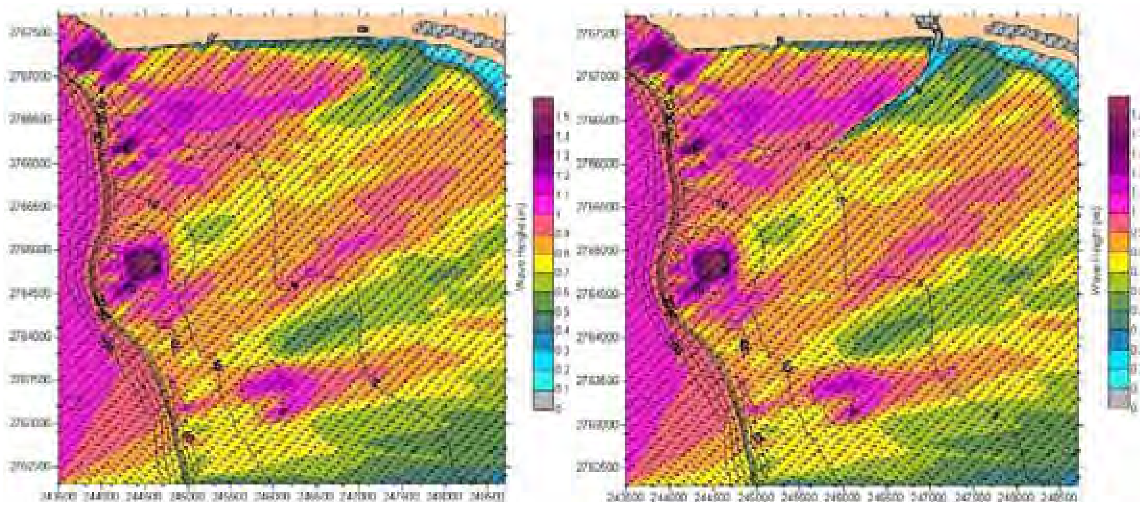


Figure 7.3 Two-dimensional plots of 0.1% exceedance swell waves coming from the west (with and without entrance structures)

Again, the results of the simulations demonstrate a number of points. These are listed following:

- Due to the prevailing direction of swell waves (west to east), the sediments are likely to be pushed towards the east.
- In the case of swell waves, there are evident changes to the nearshore wave patterns between the existing and the proposed situation. The presence of the entrance channel causes waves to concentrate more on the west side of the inlet structures.
- Swell events should generate a reversal of the erosion/accretion process, resulting in erosion of the beach on the eastern side of the inlet jetties and possibly an accumulation of sand on the western side of the entrance channel.
- The generated wave heights during swell events can also reach values of up to 1 m at the channel entrance, decreasing to 0.7 m close to the channel entrance and to 0.4 m close to the marina entrance.

8. Extreme Wave Climate

The island of New Providence is frequently affected by hurricanes and the large waves that they generate. In fact since 1900, over 134 tropical cyclones have passed within 300 km of the island. Of these cyclones, 11 were classified as Category 3, 13 as Category 4, and 3 as Category 5 hurricanes. Hurricanes of these magnitudes could impact the Albany Development in various ways. These include creation of storm surges that could cause inundation along the shoreline and erosion of the beach. In addition, hurricane waves could damage the shoreline properties and inlet jetties as well as cause significant channel infilling.

An in-house hurricane program (HURWave) was used to develop the extreme wave climate generated by hurricanes. This program uses the NOAA database of storm tracks to determine the hurricanes that passed within 300 km of the project site. The program was then used to estimate the wave heights from these hurricanes and to carry out a statistical analysis to determine the design wave and water level conditions offshore of the project site.

Figure 8.1 below shows a number of hurricanes that affected the project area. This figure also shows two of the most recent hurricanes, Jeanne and Frances, which occurred in 2004. These hurricanes reportedly caused significant beach erosion along the Albany shoreline. The directional distribution of deep water wave heights estimated in HURWave is also shown in Figure 8.1. The latter demonstrates that a large percentage of hurricane waves approach from the southwest. This approach direction would have the worst impact on the project shoreline and the marina entrance and, as such, the waves coming from this direction were chosen as the design conditions. In concurrence with current coastal design practice for the Caribbean, a 1 in 50 year wave condition was selected.

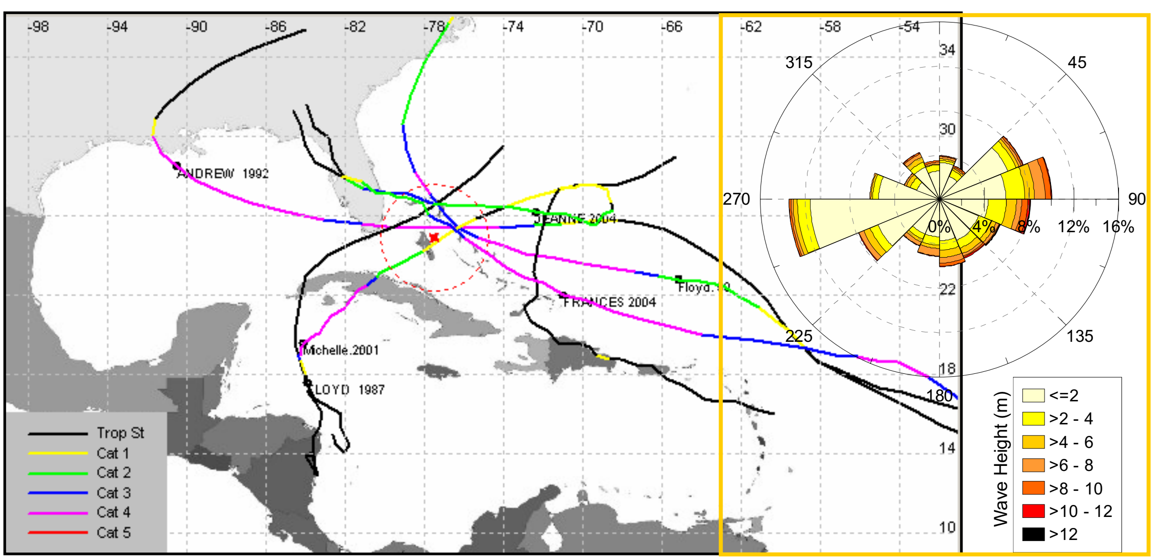


Figure 8.1 Hurricane Tracks and Directional Distribution of Waves

Once these conditions were identified, the transformation of the offshore wave climate to the nearshore area was simulated using SWAN, in a similar manner as done for the operational wave conditions. The following figure (Figure 8.2) shows the results of the wave transformations.

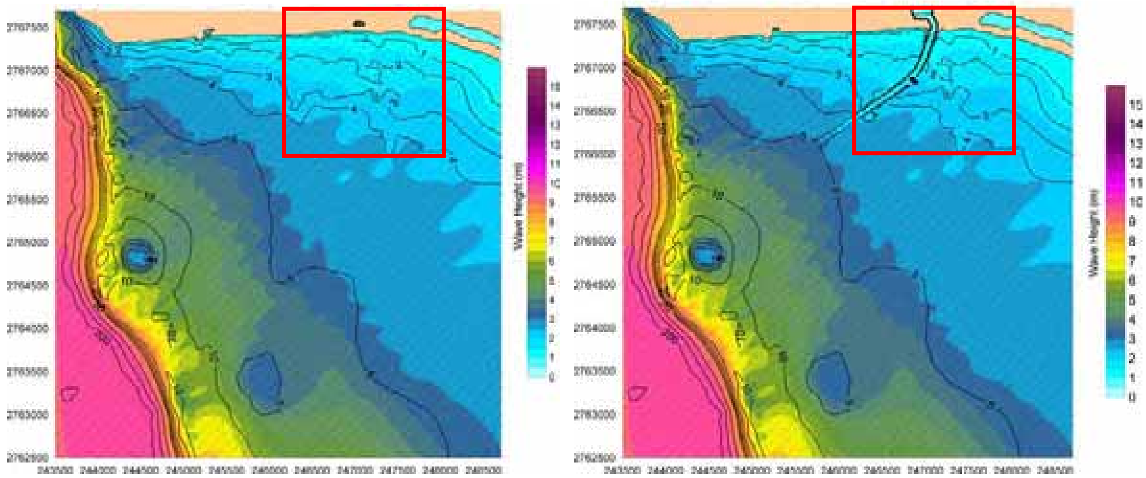


Figure 8.2 50-year hurricane wave heights (with and without entrance structures)

The wave heights reduce significantly when they reach the edge of the continental shelf and undergo further reduction as they approach the shoreline. The waves at the shoreline are reduced to 1 to 2 m (3.3 to 6.6 ft). The wave heights decrease from west to east when moving further away from the continental shelf. Figure 8.3 shows further details (selected areas in Figure 8.2) of the wave patterns in the area of the marina entrance.

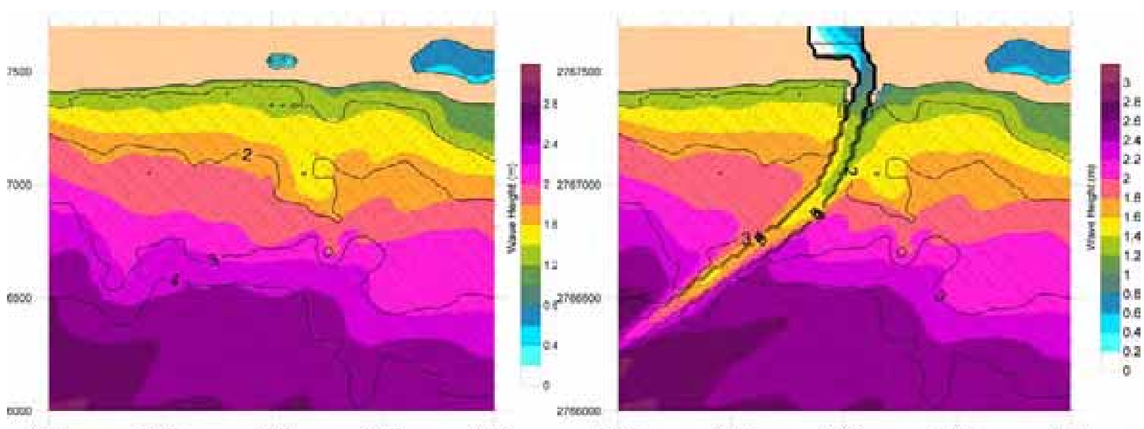


Figure 8.3 50-year hurricane wave heights at the marina entrance area (with and without entrance structures)

In contrast to what was found for the operational conditions, hurricane events cause an increase in wave energy on the eastern side of the access channel. Waves penetrate the entrance channel and are approximately 0.75 m (2.5 ft) inside the marina basin. These waves could have damaging impacts on the docks and mooring systems and, as such, appropriate design measures must be taken into consideration in the final design phase of the project to minimize these effects.

These waves are likely to cause infilling of the access channel. This will be discussed in following sections.

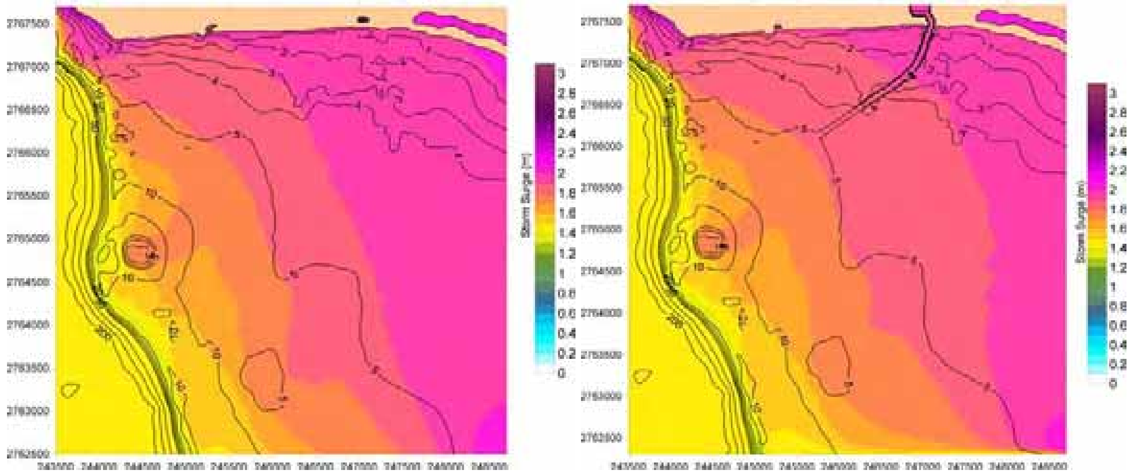


Figure 8.4 50-year hurricane storm surge (with and without entrance structures)

The storm surge is generated by a combination of factors including wind, waves, tides, projected global sea level rise and sea level increase due to the low pressure centre of the hurricane. A summation of these factors is represented in the above figure which shows a maximum storm surge of 2.1 m (7 ft), relative to MSL, at the shoreline. This implies that the floor levels of the ocean front properties should be built above this elevation.

The high surges may also lead to significant beach and dune erosion. It is therefore imperative that the Master Plan applies appropriate setback limits for the ocean front properties. In order to minimize erosion and inundation, the restrictive covenants for the beach front properties should strongly advocate the protection of the existing dune vegetation.

9. Tides, Current Patterns and Marina Water Quality

For environmental reasons, it is important that adequate water circulation is maintained in the nearshore area and inside the marina basin. In addition, it is important to evaluate the effect that the layout of the entrance channel and proposed inlet jetties may have on circulation. Maintaining water quality within a marina basin depends primarily on flushing, as determined by water circulation within the basin. Proper flushing is important to reduce the level of chemical, biological and floating solids concentrations in the marina basin that could result in impacts to biological resources. To investigate the circulation in the nearshore area as well as inside the marina basin of the Albany Development site a computer program (RMA) was used to model both the tide driven and wind driven currents.

Adequate flushing will greatly reduce or eliminate the potential for stagnation of water in a marina and will help maintain biological productivity and aesthetics. The design criterion adopted in the current study consists of ensuring that for a point source of pollution, the pollutant is diluted in the basin in an adequate amount of time. To guarantee the water quality in the marina in areas where tidal ranges are about 1 m, the US Environmental Protection Agency (USEPA) recommends a reduction of the pollutant by 90% over a 24-hour period.

9.1 Tides and Current Patterns

A two-dimensional depth averaged finite element model (RMA 10) was used to simulate the hydrodynamic conditions of the existing project site. This model uses measured tidal information as the main forcing parameter to drive the hydrodynamics of the area. As such, the tidal data collected during the field survey was used as input to the model. Additionally, the measured current data collected by the current meter (SD6000) deployed in the vicinity of the proposed marina entrance were used to calibrate the model by comparing them against the currents simulated by the model.

Figure 9.1 shows the time series of the tidal elevation and the measured current velocities. This figure clearly shows the influence of the Neap and Spring tidal cycles on the current speeds. During the Neap cycle, the currents do not exceed 10 cm/s while during the Spring cycle the currents go up to 20 cm/s.

The calibration procedure involved adjusting the bottom friction terms in the model until a reasonable agreement was obtained between the modeled currents and those measured using the current meter. Figure 9.2 shows the scatter plot of the modeled and measured current speeds. This figure clearly shows that the measured currents move primarily in a WNW and ESE direction, with the stronger currents occurring during the rising tide. In addition, there were a small number of occurrences during the measurement period when currents were going to the northeast.

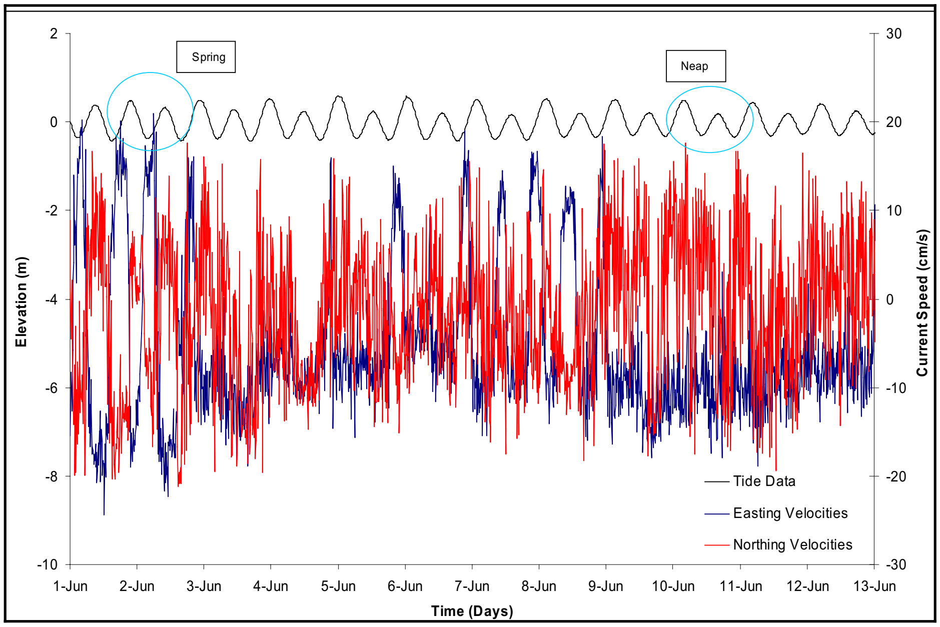


Figure 9.1 Tide levels and current speeds for the period 1st June to 13th June 2005

The modelled current directions appear to be constrained by the local bathymetry and the nearby shoreline orientation. These two factors force the currents in a more east-west orientation. The measured data by contrast shows more scatter in the current speeds. This may be due to wind effects and varying bottom friction throughout the seabed, eddies and gyres and a number of factors that the hydrodynamic model did not take into account.

In general, however, the model predicts within the right range of velocities of the measured data and was therefore used in the simulation to determine the effects of the Albany marina on the hydrodynamics of the area.

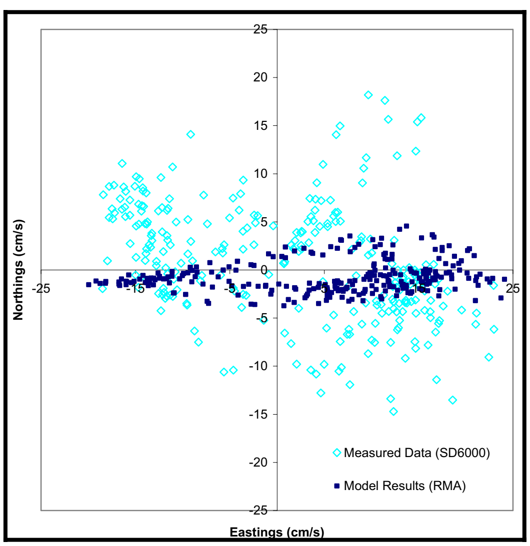


Figure 9.2 Scatter diagram of the measured (SD6000) and modelled (RMA) current velocities

Hydrodynamic Modelling Results

The results of the RMA model for the existing and projected marina scenarios are shown in Figure 9.3 and Figure 9.4. These figures clearly show that there is a reduction in current velocities around the proposed structures during both rising and falling tides. During both rising and falling tides, local gyres are formed at the eastern and western ends of the proposed structures respectively.

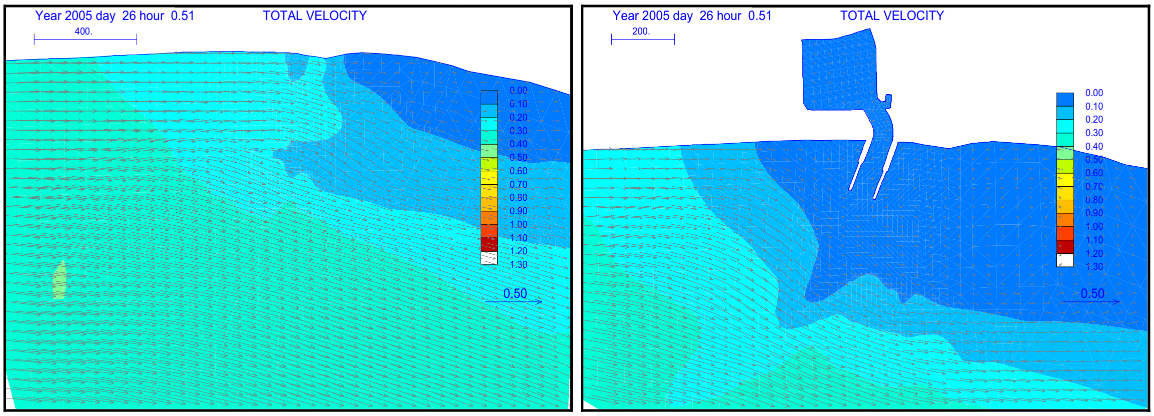


Figure 9.3 Current patterns during rising tide (Existing and projected scenarios)

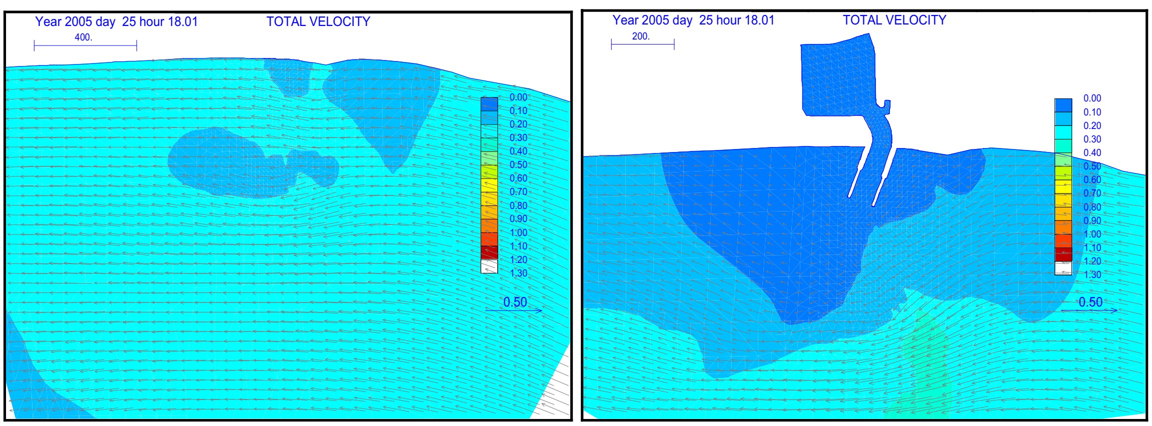


Figure 9.4 Current patterns during falling tide (existing and projected scenarios)

Figure 9.5 shows a scatter plot of the measured and modelled current velocities for the existing and projected scenarios at a location close to the entrance to the marina (approximately where the current meter was deployed). This figure indicates a shift in the direction of the currents to a south-westerly direction in this location during the falling tide, due to the presence of the inlet jetties. Additionally, this figure also shows a reduction in the current velocities due to the presence of these structures.

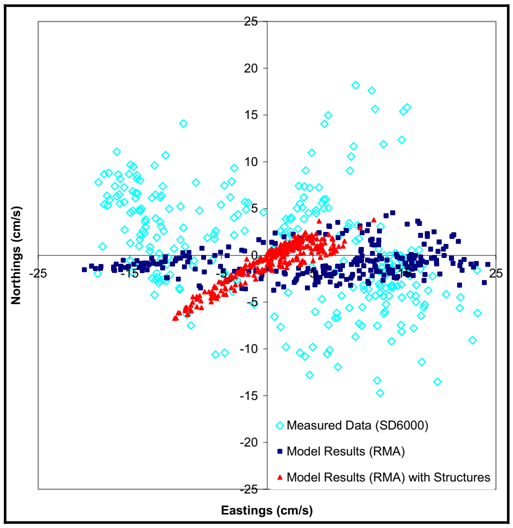


Figure 9.5 Scatter diagram of the measured and modelled current velocities (existing and projected scenarios)

The change in the current circulation patterns caused by the presence of the entrance channels may affect the sediment transport patterns especially on the eastern side of the channel.

9.2 Water Quality in the Marina

A water quality model (RMA-11) was used to examine and optimize the flushing characteristics of the proposed marina. In order to test the flushing performance of the marina, an arbitrary conservative pollution source was to be placed at a specified location inside the marina basin. The water quality model was run to simulate a 19-day period. At the start of the simulation, an arbitrary pollutant with a concentration of 50 mg/l was introduced at the center of the marina basin for a period of 4 hours. During the simulation, the pollutant was allowed to disperse and be advected by the tidal current patterns, which had been determined from the hydrodynamic model. A constant wind speed of 2 m/s with a north-westerly direction was applied in the modelling.

Water Quality Modelling Results

Figure 9.6 shows snapshots of the spread of the arbitrary constituent over time. It shows the marina water quality at the start of the pollution process and 24 hours later during rising tide cycle.

As shown in this figure, the pollutant concentration inside the marina basin after 24 hours is between 1 and 3 mg/l. This implies that more than 90% of the initial pollutant concentration has been flushed out of the basin. According to the USEPA recommendations, for a tidal range of approximately 1 m, as is the case of this area, 90% of the initial pollutant concentration should be flushed out over a 24-hour period for optimum water conditions inside the basin. Therefore, according to the model results, the USEPA recommendations are achieved. However, given the uncertainties and required assumptions in any model-based approach, regular water quality monitoring is advised during the operational phase to ensure appropriate water circulation and water exchange. In addition, more detailed modeling should be carried out with the tide and current data that are currently being recorded. Mechanical flushing would be advised in the case that the water quality monitoring program indicates poor water conditions inside the basin. For a marina of this size, a pumping rate of approximately 0.2 to 0.3 m^3/s or 17,280 to 25,920 m^3/day would be required. The location for flow discharge should be the end of the inlet jetties, and not through the beach or into the ground.

The direction of movement of the pollutant once it leaves the marina basin will be subjected to the stage of the tide and the prevailing wind conditions.

Finally, it should be noted that the connection with the neighbouring channel and basin is likely to affect the water circulation patterns inside the marina basin, and therefore negatively affect its water quality. This should be taken into account in the final design phase and for the eventual water quality monitoring program.

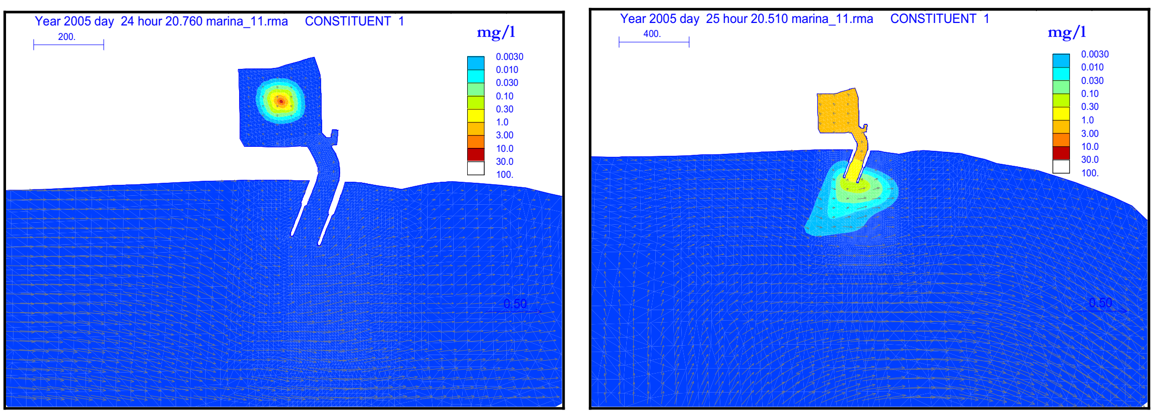


Figure 9.6 Marina water quality at start of pollution and 24 hours later (rising tide)

10. Sediment Transport

The preceding sections on wave analysis suggest that the daily-wave conditions generally push sand towards the west. The beach width, however, is relatively consistent along the entire coastline between Stuarts Cove and Adelaide. This implies that the littoral drift towards the west is being balanced by the seasonal swell and storm occurrences that cause sediment drift towards the east.

While the measurements and modeling of the wave and current patterns give an indication of the littoral characteristics of the shoreline, reviewing the physical characteristics can be even more indicative. The satellite and aerial images of the site, offer this opportunity.

10.1 Inferences from the Physical Shoreline Characteristics

Figure 10.1 and Figure 10.2 below show the shoreline from Stuart Coves to South Ocean Hotel and the Albany property shoreline, respectively.

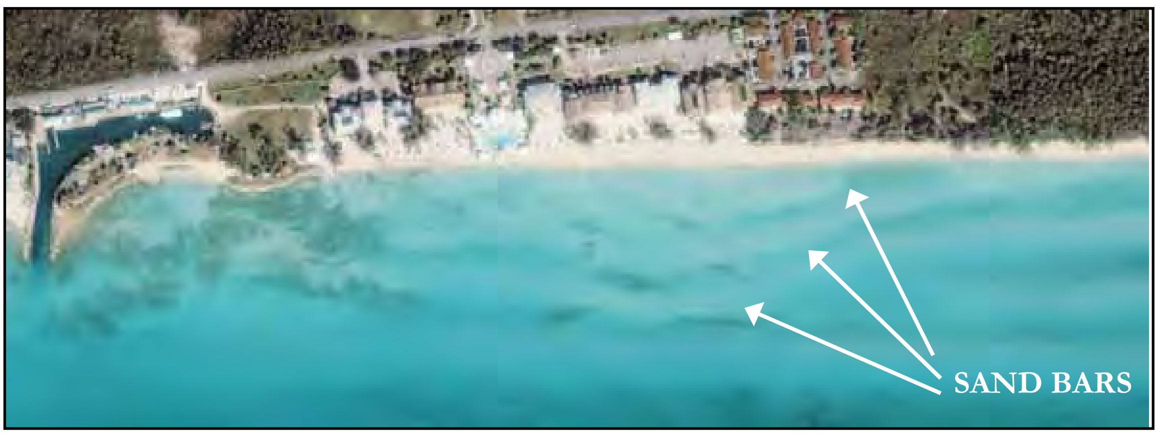


Figure 10.1 Images depicting sandbars in the nearshore zone. Stuart Coves to South Ocean Hotel.

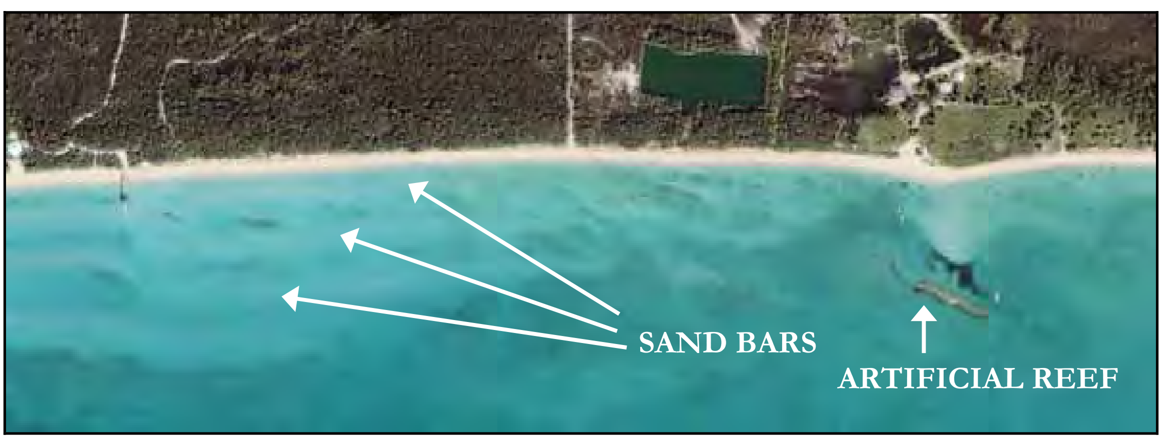


Figure 10.2 Images depicting sandbars in the nearshore zone, Albany Development

The image shows two important features. The first is the presence of the sand bars along the shoreline and the second is the accretion landward of the artificial reef.

There are three main rows of bars along the shoreline. As previously mentioned, sand bars are a consequence of the different seasonal wave climates. These bars actually show that the shoreline is exposed to significant seasonal cross-shore movement of sand. The semi-oval-shaped bars in front of South Ocean Hotel provide further evidence of this phenomenon. The dune vegetation was removed and the seawall was built along the beach of this property. This has contributed to erosion of the beach. The irregularly shaped sand bars and the existence of more rows of bars in this area, show that the sand has been moved offshore.

The sand bars extend along the entire coastline between Stuart Coves and the eastern property boundary of Albany. During swell events sand is moved from the beach into these bars and back onto the beach under mild wave conditions. The sand bars are then critical to the stability of the beaches and as such, with the exception of creating the channel, they should not be dredged. East of Albany up to Adelaide, the presence of both artificial and natural reef systems does not facilitate their formation.

The shoreline landward of the artificial reef system has protruded seaward. The nearshore area is also shallower in this area. This build up typically happens behind these types of structures and is evidence to the fact that there is longshore movement of sand. This feature confirms that there will be a build up of sand on either side of the inlet jetties after construction.

10.2 Expected Shoreline Changes

Detailed investigation of this phenomenon may be carried out with longshore sediment transport models such as LITPack and Genesis. These models are able to reasonably quantify the sediment transport rates as well as the expected shoreline changes (locations and extent of erosion and accretion areas) along the beaches on both sides of the proposed inlet jetties. These investigations are currently ongoing and will be submitted as an addendum to this report.

While the actual rates and amounts of erosion and accretion can not be "precisely" defined at this stage, the investigations of the wave and current patterns and the physical site characteristics are more than sufficient to reasonably forecast impacts and, more importantly, identify the required mitigation strategies.

It is expected that at different times of the year there will be periods of accretion and erosion of sand on either side of the inlet structures. As such, under daily wave conditions, accumulation of sand on the eastern side of the entrance structures will cause some degree of erosion east of the point of build-up and also on the western side of the structures. This is due to the fact that over a relatively short time scale, there is a constant quantity of sand on the beach and therefore a build-up in one area implies one or a combination of two occurrences: 1) sand has been relocated from an updrift point (in this case from the beach east of the point of build-up); and/or 2) sand is not being supplied to a down drift location (in this case to the western side of the channel). The converse will occur under seasonal swell events. The expected shoreline changes will be shown in the addendum to this report as a result of the above-mentioned ongoing sediment transport modeling.

In order to minimize the impacts of this phenomenon, it is proposed that both sides are initially nourished with sand and monitored for several years after construction. In the event that monitoring shows significant erosion on one side of the inlet over an extended period, it is advised to renourish the eroded areas as necessary to reform the original beach width. The dredged sand should be taken from either 1) an area that shows significant accretion or 2) from the entrance channel. This should be dictated by the beach profile monitoring program. Consequently, to allow for heavy equipment to carry out the required nourishment activities, it will be important to maintain access for heavy equipment to the beach.

10.3 Entrance Channel Shoaling

Given the cross-shore and longshore movements of sand in the nearshore zone, the inlet jetties have been proposed to extend beyond the area within which sediment movement occurs. In addition to the satellite images and observations in the field, a sediment transport model was used to estimate the extent of nearshore sediment movement. The model used for this purpose, LITPACK, was developed by the Danish Hydraulic Institute (DHI).

The results of the simulation of the daily wave conditions showed that sediment movement occurs mostly within a distance of 120 m (131 yds) from the shoreline. As such, in an attempt to abate rapid channel refilling, it has been proposed to extend the inlet jetties across this zone. As the purpose of this extension is primarily to minimize movement of sand across the channel, low-crested breakwater extensions have been proposed. The details of these structures are shown in Appendix I 'Drawings'.

With the proposed inlet structures and breakwater extensions, it is not expected that there will be significant channel sedimentation under daily conditions. However, if there is significant accumulation of sand on either side of the entrance channel, then the sand bars may migrate further offshore. This would then cause channel infilling. This point therefore emphasizes the need for monitoring of the beach.

As the channel is not likely to be filled with sand from the nearshore zone under daily conditions, it is unlikely that there will be any significant migration of sand from the adjacent beaches into the channel i.e. the channel will not act as a sink to sand moving along the shoreline on a daily basis. The channel should then not compound any negative changes to the shoreline caused by the presence of the jetty structures.

10.4 Access Channel Shoaling

Hurricane events and severe swell conditions may cause significant channel infilling mostly along the access channel. LITPACK was used to estimate the expected infilling rates during a storm event. Hurricane waves approaching from the west-southwest direction would have the worst impact on the project shoreline and the marina entrance and, as such, the waves coming from this direction were chosen in the sediment transport modelling of a storm event.

A cross-shore profile was modeled from a 5m-depth contour up to the shoreline. The simulation was done with the existing profile bathymetry (without access channel) and also for a profile with the proposed access channel. Figure 10.3 shows the cross-shore profile modelled with the projected access channel. Figure 10.4 depicts the simulated alongshore results for the selected profile, showing in red the bathymetry of the cross-shore profile from the 5m-contour up to the shoreline for the projected scenario, in black the sediment transport rates along the cross-shore profile for the existing situation without the access channel, and in blue the sediment transport rates along the cross-shore profile for the projected scenario with the access channel.

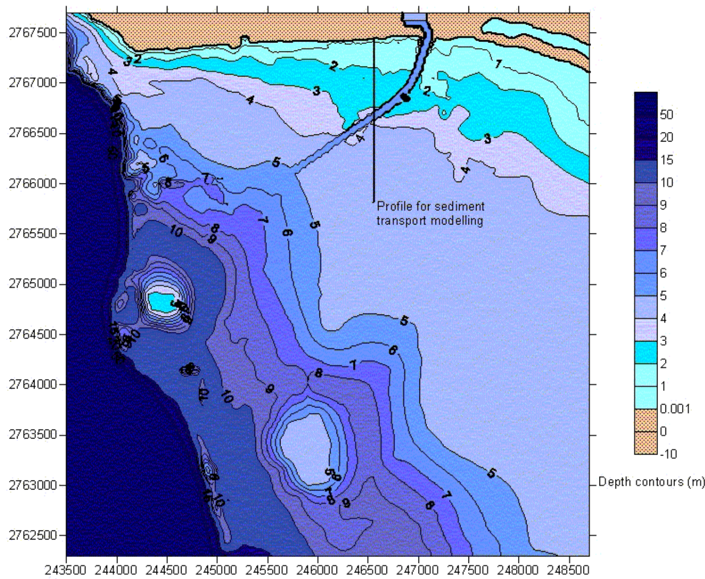


Figure 10.3 Cross-shore profile for sediment transport modelling

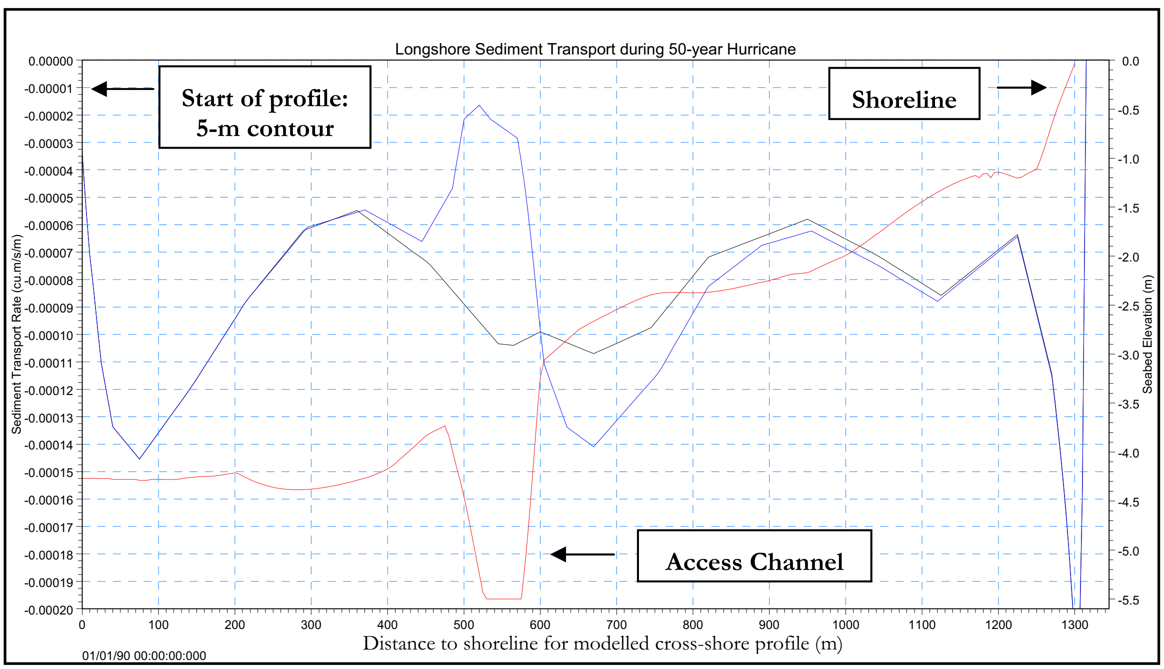


Figure 10.4 Alongshore Sediment transport rates under storm conditions

(___ Bathymetry with channel; ___ Rates for existing bathy; ___ Rates with channel in place)

The results indicate that sediment transport extends across the entire profile. The sediment transport is shown as negative in the graph indicating the sediment movement towards the east. Lower values on the vertical axis indicate higher transport rates.

As indicated by the blue line in the graph, the sediment transport capacity (theoretical sediment transport rate assuming that sand is available for transport) is reduced over the channel, as expected. For a 15-hour storm, the maximum amount of sediment likely to accumulate in the channel was estimated as 8.1 m^3/m along the channel length. For an estimated frequency of storm activity of 1.3 to 2 storms per year, this may lead to a maximum of 22 to 34 cm (8.7 to 13.4 inches) of sediment infilling in the channel. Consequently, maintenance dredging of the channel may have to be carried out with a frequency of once every 3 to 4 years. With the proposed frequency for the dredging operations, the estimated average dredging amount along the channel may be on the order of approximately 56,000 m^3.

It should be noted that these shoaling estimates are based on the assumption that there is enough sand available for transport in the area. Taking into account that there is no information available regarding the depth-to-rock below the ambient seabed (and therefore the extent of the sand layer), there might be a level of conservatism in the model results. The observations of similar channels in The Bahamas indicate that the channels remain relatively clear over time. In addition, the estimated shoaling rates might be limited to portions of the channel and may not necessarily characterize the entire length, reducing the frequency and amount of dredging required.

11. Summary of Potential Impacts and Mitigating Measures

A summary of the most important findings of the coastal processes investigation is presented in this section. The entrance channel and nearshore structures proposed for the construction of the marina of the Albany Development have the potential to impact on the marine environment. Based on all the studies carried out, the potential impacts that the proposed works are expected to have on the project site, both during and after construction, are also described herein. Finally, the measures to mitigate the impacts associated with the dredging, clearing and stone placement construction activities are addressed.

Following this report, all mitigation and monitoring measures described herein will be included in a comprehensive Environmental Management Plan for the Albany project to be submitted to the regulatory agencies. This management plan will be finalized once the project has been approved and after the final design is concluded.

11.1 Construction Phase

Summary of construction activities and impacts

The different activities that will need to be carried out for the construction of the proposed marina and entrance channel can be summarized as follows:

- Dredging of the entrance channel and marina basin
- Dredging of the access channel
- Disposal of dredged materials
- Construction of inlet jetties
- Beach nourishment at Albany Development
- Sourcing of boulders for the construction of the different structures
- Pile driving to mark the access channel

The most potentially significant negative marine impacts associated with the proposed entrance channel and marina inlet will occur during the construction activities. The following are the expected impacts that the proposed works will have:

- The dredging, beach nourishment and jetty placement could each, and collectively, result in substantial sustained increases in turbidity, reducing the light available to the corals and thereby impact the few sensitive coral communities in the vicinity, as well as the productivity of the algal species of the area;
- These activities could also result in sedimentation of coral heads present in the area, also reducing access to light, and potentially damaging the coral heads;
- Other potential impacts during construction activities relate to the possible disturbances to the regular activities of local recreational boaters, and the commercial diving activities which take place in the area.

- The final orientation of the entrance channel, and the footprints of the inlet jetties, may coincide with the location of coral heads, which would therefore be damaged or lost during construction activities.
- A potentially positive impact will come from the placement of the armour stones for the inlet jetties. The surface of the stones, as well as the crevices between the stones will provide substrate and habitat for several marine species that are typically associated with coral reefs. The edges of the channel will also serve for creation of marine habitat as was observed in similar dredged channels in the vicinity of the project site (Figure 12.4 to Figure 12.6).

Mitigation Measures

In order to minimize the impacts of the construction activities on the nearshore environment, certain measures will have to be considered and employed. These include:

- It should be noted that the initial benthic assessment was conducted prior to the preliminary and final design stages of the project. It is important that prior to construction, the specific areas of the proposed channel and inlet jetties be surveyed once again, and any coral heads or other sensitive organisms be appropriately relocated outside of the influence of the construction activities. Specific recommendations for transplanting or protection can then be made.
- It is recommended that appropriate turbidity barriers be deployed at all times during dredging, nourishment and construction phases to ring each and all of the construction activities. The type of barriers selected should take into consideration the shallowness of the area and the prevailing wave and current conditions. The extent of each area ringed should also be carefully determined in order to maximize the effectiveness of the barrier, especially during the proposed dredging and nourishment activities.
- Monitoring of the turbidity prior to, during and for a short period after the construction activities. Prior to the construction, monitoring should be done in at least three locations in the vicinity of the area to be dredged, and in another two locations on the eastern and western sides of the entrance channel. This monitoring will be used to establish the background or baseline turbidity values at these locations. During and after construction the turbidity levels should also be monitored. Should turbidity readings exceed the prescribed limits (29 NTU above background levels), then remedial actions such as redeployment of the turbidity control devices, should be taken. Should this reading exceed the prescribed limits in the vicinity of a significant resource (i.e. a coral head), then construction should be temporarily halted.
- Use of low turbidity dredging equipment. Sand should be first dredged with a suction dredger. Then, a cutter or barge-mounted excavator should be used to remove the

necessary rock. With the exception of creating the channel, it is advised not to extend the dredging activity to the sand bars. Blasting is not recommended.

- The marina basin should be closed during the excavation phase to avoid any impact on the marine habitats. Prior to the opening of the basin to open sea, all walls should be stabilized so that sedimentation plumes from unconsolidated shorelines are minimized.
- The areas for disposal of the dredged sand material should be identified. Part of the sand dredged from the entrance channel (see Section 5) is proposed to be used for advanced beach nourishment at the Albany Development. It is proposed to widen the stretch of beach (1 km or 3,280 ft, approximately) in front of the Albany Development by 5 m. For this proposed width an estimated volume of 30,000 to 40,000 m^3 (33,000 to 44,000 yd^3) of sand will be required.
- The areas for disposal of the rock material should be also identified. As much of the limestone as possible should be utilized in the construction. The rest should be disposed as on site fill material at appropriate dumping sites. The dredged rock material may also be used for creation of artificial reefs in suitable deep water that will not affect shoreline processes.
- Dredging of the marina basin should be accomplished in stages, physically isolated from the open water, using settling ponds. Plug between basin and sea could be opened once all interior excavation is complete and interior turbidity is at minimum.
- The source of the material to be used for the construction of the different structures should be identified. Freeport could be an appropriate source for rock material; nevertheless the material should be checked to ensure that it meets the required standards for marine construction. The important characteristics include hardness, density, abrasive resistance, magnesium sulphate soundness and potential for water absorption. If the rock does not meet the necessary requirements, it would have to be imported from another location.
- The final orientation of the entrance channel, the construction methodologies and traffic will need to be conducted in a manner so as to have a minimal effect on the typical local recreational boating and commercial diving activities.

11.2 Operational Phase

In addition to the impacts generated from the construction phase, it is important to take into consideration the long-term impacts that will remain during the operational phase once the proposed works are finalized. First, a summary of the coastal processes investigated and the impacts to be expected from each of them is provided. Then, the different measures to reduce or remove the adverse environmental impact and to enhance the beneficial impacts during the operational phase are proposed.

11.2.1 Shoreline Erosion

Summary of processes and impacts

- As derived from the wave climate, current patterns and sediment transport investigations, the sediment movement is predominantly from east to west under daily conditions. However, seasonal as well as episodic events (hurricanes) are expected to cause occasional drifts towards the east. The presence of the inlet structures will break the littoral cell in two, inhibiting the natural drift of sand (towards the west under daily conditions and occasionally towards the east under episodic events). As a result, sand is very likely to accumulate on the eastern side of the eastern inlet jetty, while beach erosion will occur on the western side of the entrance channel. During winter swells and hurricane events there will be a reversal of this process, resulting in a reduction of the beach erosion and possibly an accumulation of sand on the western side of the entrance channel.
- As observed in the hydrodynamic modelling results, the presence of the inlet structures produces a slight change in the current patterns in the proximity of the marina entrance during the falling tide, which is difficult to quantify. This is not expected to cause a significant impact on the predominant littoral drift.
- The present dune vegetation is currently acting as a buffer to erosion. Its presence will certainly reduce inundation during storm events and long term erosion, and therefore it is strongly advised to be protected and preserved during construction and thereafter.
- The beach shoreline is vulnerable to waves and storm surges generated by hurricanes. However, once appropriate setback limits have been established, the oceanfront properties should not experience significant damage as a result of inundation.

Mitigation Measures

In order to minimize the adverse environmental impacts and to enhance the beneficial impacts, certain measures will have to be considered and employed. These include:

- As part of the mitigating measures during construction to minimize the adverse impact of the structures on Albany beach, the stretch of beach in front of the Albany Development and east of the property boundary should be subjected to advance nourishment with the sand material dredged from the entrance channel. An estimated volume on the order of 10,000 m^3 (11,000 yd^3) is likely to be required on both sides of the channel but an additional 20,000 to 30,000 m^3 (22,000 to 33,000 yd^3) is proposed to widen and enhance the Albany Beach.
- In addition to the beach nourishment performed during the construction phase, it is advised to consider installing a sand by-passing system to transfer sand from one side of the inlet to the other when necessary. The sand by-passing system could be fixed, but more practically it could be done in periodic operations mobilizing the necessary equipment for sand by-passing.
- A beach monitoring plan should be prepared and undertaken prior, during and after construction. This monitoring programme would consist of carrying out a beach

profile survey at specific locations. Prior to the construction phase, several beach profiles should be taken on the west and east sides of the inlet jetties at a frequency of once every three months. During construction of the entrance channel, beach profiles should be taken at the same locations once per month. Finally, after construction, the surveying frequency would be reduced to once every three months during the first two years, and once every six months for the following three years.

- Dune vegetation should be protected during and after construction.
- The appropriate setback limit should be driven by requirements for protection of the coastal strand (dune vegetation) and should be dictated by the terrestrial ecologists. All floor elevations of the ocean front properties should have a minimum elevation of 2.1 m (7 ft) relative to the mean sea level.

11.2.2 Channel Sedimentation

Summary of processes and impacts

The inlet structures are proposed to be extended outside the zone within which nearshore sediment movement occurs under daily wave conditions. This will minimize channel infilling. If there is significant accumulation of sand on either side of the entrance channel, then the sand bars may migrate farther offshore. This would lead to faster infilling of the channel. During some swell events and especially tropical storms, there could be excessive channel filling. It has been estimated that the maximum accumulated sediment height above the channel bottom will be 22 to 34 cm (8.7 to 13.4 inches) per year.

Mitigation Measures

- Maintenance dredging of the channel will have to be carried out with a frequency of at least once every 3 to 4 years. Based upon model results, each maintenance dredging operation should yield in the order of approximately 56,000 m^3 of sand from the access channel. This sand should be used to nourish areas along the beach where necessary. These areas should be identified by the beach monitoring program.
- Regular monitoring of the channel depths should be carried out, particularly after storm events.

11.2.3 Marina Water Quality

Summary of processes and impacts

The hydrodynamic modelling of the preliminary basin design has demonstrated that more than 90% of a pollutant concentration was flushed out of the basin over a 24-hour period. This is in agreement with the USEPA standards which require that 90% is flushed over a 24-hour period. It should be noted that generally, there are uncertainties associated with this type of model, and as such further modeling should be carried out with additional data to refine these results. Additionally, the connection with the neighbouring channel and basin is likely to negatively affect its water quality inside the marina basin. This effect should also be taken into account in the final design phase.

Mitigation Measures

- The final design phase of the project should seek to refine certain aspects of the basin such as the sharp-edged corners, to ensure adequate flushing within the marina. The modeling should be calibrated with the additional current and tide data that is currently being recorded.
- Regular water quality monitoring of the marina basin and the neighbouring basin is advised during the operational phase to ensure appropriate water circulation and water exchange.
- Mechanical flushing would be advised in the case that the water quality monitoring program indicates relatively poor water conditions inside the basin.

12. Examples of Entrance Channel Impacts on Marine Ecosystem

The entrance channel and nearshore structures proposed for the construction of the marina of the Albany Development have the potential to impact on the marine environment. The potential impacts on the coastal processes have been described in the previous section.

A number of similar projects have been carried out in the past in different locations of New Providence Island. Figure 12.1 shows an aerial view of New Providence Island where several examples of man-made and natural inlets are highlighted.

Figure 12.1 Aerial view of New Providence Island showing natural and artificial channels

From the photograph above, the Lyford Cay Channel in the north-west side of the island (number 12 in Figure 12.1) and the Port New Providence Channel in the south-east of the island (number 9 in Figure 12.1) are similar to the proposed channel for the Albany project. The following photographs in Figure 12.2 and Figure 12.3 show aerial views of these two channels. Similar to the proposed Albany channel, these channels were dredged across the shoreline and out to depths beyond 4 m (12 ft). In addition, both channels are over 46 m (150 ft) wide.

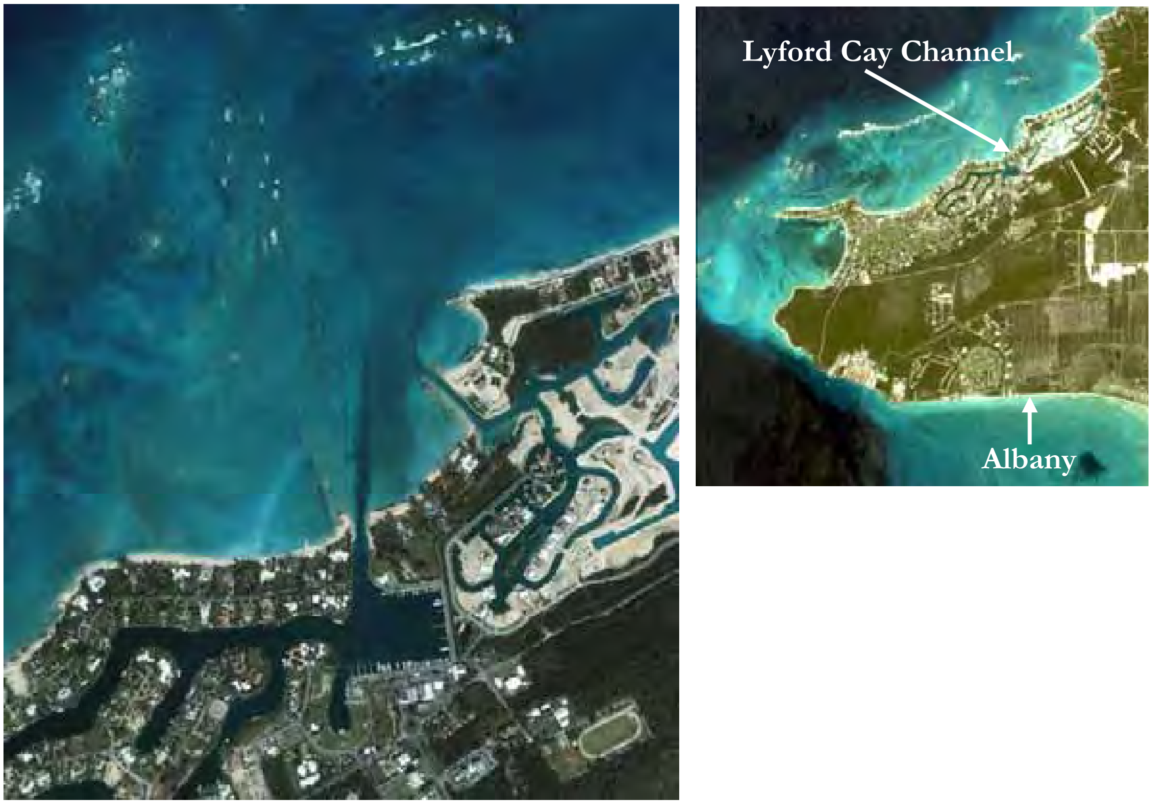


Figure 12.2 Aerial view of Lyford Cay Channel

Figure 12.3 Aerial view of Port New Providence Channel

In order to give a more detailed visual impression of the impacts of one of these artificial channel entrances, several underwater photographs of the Lyford Cay channel are presented in Figure 12.4 to Figure 12.6. These photographs were taken in the year 2000 and depict the features of the channel walls and bottom some years after its construction.

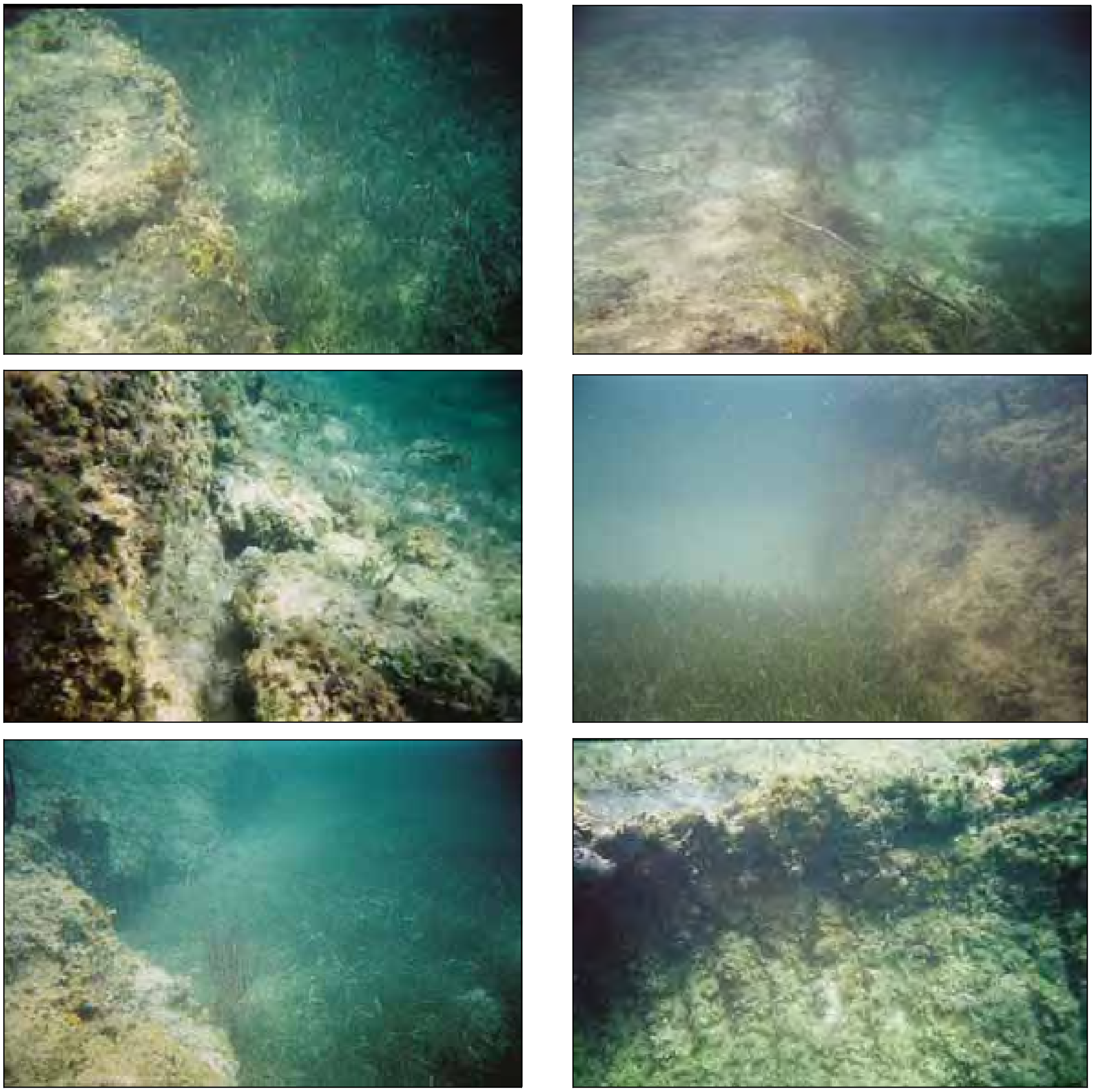


Figure 12.4 Views of side of channel cut colonized with Thalassia

Figure 12.4 shows several pictures of the side of the channel cut. It can be observed that fine material has settled into the bottom of the dredged cut establishing a dense community of Turtle-grass (Thalassia testedium). Additionally, the presence of loose rocks allows for the creation of significant habitat/cover for fish and other marine organisms.

Figure 12.5 shows a detailed view of the Turtle-grass growing on the bottom of the Lyford Cay Channel. It was reported that this species has not been found in adjacent rocky bottom areas that have not been dredged within this area. This community is a habitat for marine life especially for juvenile fish. The Turtle-grass can be observed as well in Figure 12.6, which shows a view of the channel bottom from the top of the rocky vertical cut that defines the edge of the channel.

Figure 12.5 Detailed views of Turtle-grass (Thalassia testedium) on the bottom of Lyford Cay Channel

Figure 12.6 View of channel bottom from the top of the rocky vertical cut

The Lyford Cay Channel represents an example of the evolution of a dredged channel towards a marine habitat for sedentary and mobile species. It is difficult to say whether a similar habitat will definitely be created along the proposed channel for the Albany project, but these images suggest that these types of artificial creations can naturally transform into diverse and structured marine ecosystems.

In a similar way as presented in Figure 12.2 and in an attempt to give an impression of how the Albany entrance channel would look after its construction, Figure 12.7 presents an artistic impression of the potential air view of the dredged channel.

Figure 12.7 Artistic impression of the proposed Albany Entrance Channel

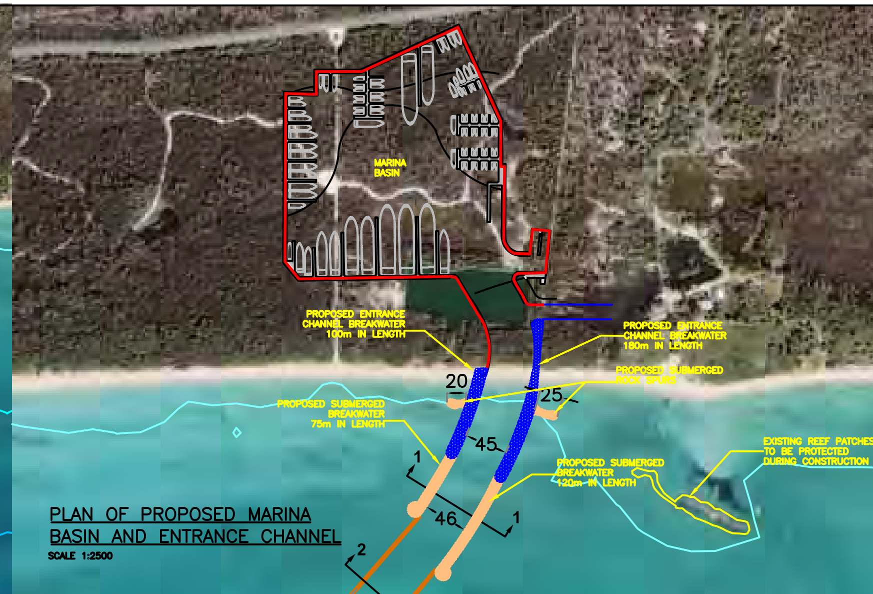
13. General Recommendations

In addition to the mitigation measures proposed in the previous section, the following recommendations are suggested:

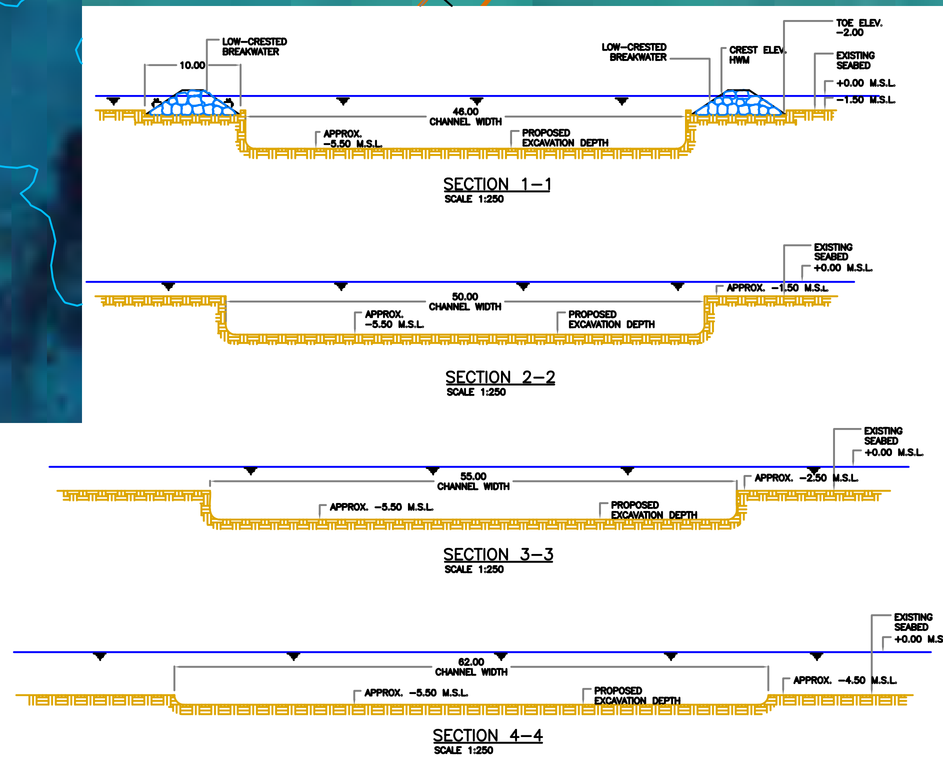
- Cross-cutting issues to be considered in both construction and operational phases of the project include the need to establish a public awareness and information programme and to involve selected stakeholders through consultative mechanisms in various aspects of the project. A public awareness and information programme is critical to dispel inaccurate and misleading information and notions about the development of the marina and its components. It is therefore advisable to establish a proactive public awareness and information programme prior to the start of the construction of the marina and access channel.
- An ongoing programme of consultation with selected area residents in the immediate proximity of the site, and yachting interest groups, can be useful to ensure that the project activities are in sync with current practices. The consultative mechanism should be designed to exchange information and to establish and maintain synergetic relationships.
- For the final design phase, it is recommended to make field measurements of depth-to-rock below the ambient seabed (along the proposed channel alignment) using a jet probe, in order to quantify how much of the material to be dredged will be rock or sand.
- During the project construction and operational phases, all efforts should be made to prevent the production and use of toxic substances which could lead to further damage to the marine environment.
- Management should take steps to ensure that there is no dumping of oily waste from yachts or land-based facilities within the project site. Careful consideration should be given to the requirements for storage and appropriate off-site disposal of waste oil. An Oil Spill Contingency Plan is recommended to be developed and implemented by the Developer.
- Close attention should be paid to the location and design of fuel storage and dispensing facilities. Fuel tanks should preferably be located underground, with adequately sized, impermeable containment structures. Fuel pipelines should be fitted with isolating valves at strategic locations, to enable rapid lock-off in case of emergency.
- Suitable equipment and materials for the clean-up of small oil spills should be available for use at all times.
- The effluent or brine from desalination plants on board mega yachts must not be disposed of within the marina area, but in accordance with international standards.
- Albany Development Marina should develop its own disaster management plan to mitigate against, and facilitate emergency response to, hurricane and fire emergencies among others.

Appendix I: Drawings

PLAN OF PROPOSED MARINA CHANNEL AND BASIN
SCALE 1:5000



PLAN OF PROPOSED MARINA BASIN AND ENTRANCE CHANNEL
SCALE 1:2500



NOTES

1. All dimensions and elevations are in meters unless otherwise shown.
2. All elevations are relative MSL.
3. Survey to be verified on site prior to start of works.

rev.	description	date
02	issued for regulatory review	20-07-05
01	issued for client review	01-07-05

project title

ALBANY DEVELOPMENT, NEW PROVIDENCE, BAHAMAS

client

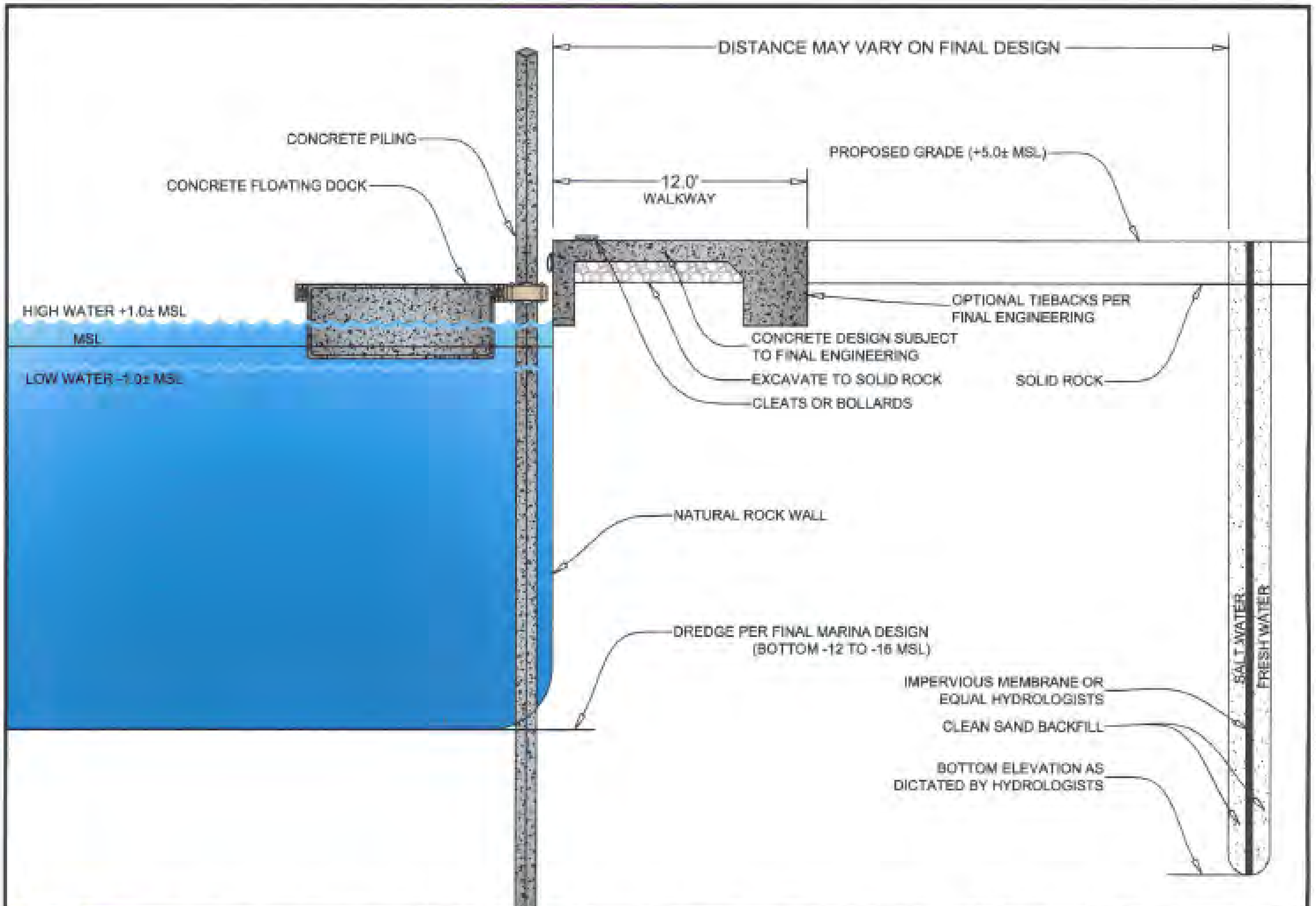
RIDGEFIELD HOLDINGS LTD.

drawing title

PRELIMINARY PLANS & CROSS-SECTIONS

SMITH WARNER INTERNATIONAL
Unit 2, Seymour Park, 2 Seymour Avenue
Kingston 10, Jamaica, W.I.
Tel: (876)978-8950 / (876)978-7415
Fax: (876)978-0685

drawn	Leighton Ellis	July '05	drawing no. SWIL-AD01
checked	Jamel Banton	July '05	
scale AS SHOWN	sheet no. 1 of 1		



Turrell & Associates, Inc.
Marine & Environmental Consulting
3584 Exchange Ave, Suite B, Naples, FL 34104-3732
Email: tuna@turrell-associates.com Phone: (239) 643-0166 Fax: (239) 643-6632

ALBANY MARINA

CONCEPTUAL BULKHEAD & CURTAIN WALL

DESIGNED:	T.T.T.	REVISION:	TAB NAME:	Bulkhead
DRAWN BY:	SS	N/A	SHEET:	01
CREATED:	03-22-06	N/A	SCALE:	N.T.S.
JOB NO.:	0488	N/A		
SECTION-		TOWNSHIP-	RANGE-	

MARINE RESOURCES & PROPOSED IMPACTS

	MACROALGAE	CORAL	SEAGRASS	SPONGE	AREA
AREA 1	81%	1.42%	0%	11%	2.48 Acs.
AREA 2	28%	0.2%	13.8%	1.4%	7.07 Acs.
AREA 3	21.5%	12.5%	0%	8%	0.39 Acs.
AREA 4	70.2%	2.45%	1.29%	8.44%	4.80 Acs.
AREA 5	37%	2%	3%	0%	2.25 Acs.
				TOTAL IMPACT AREA	16.99 Acs.

LEGEND

- HIGH IMPACT
- MEDIUM IMPACT
- LOW IMPACT

f/project/233120/workin/233120_marineresources_8x11.dwg

T.K. BLANKENSHIP
FL.REG.55910

PARK RIDGE SECURITIES CORPORATION
NASSAU
BAHAMAS

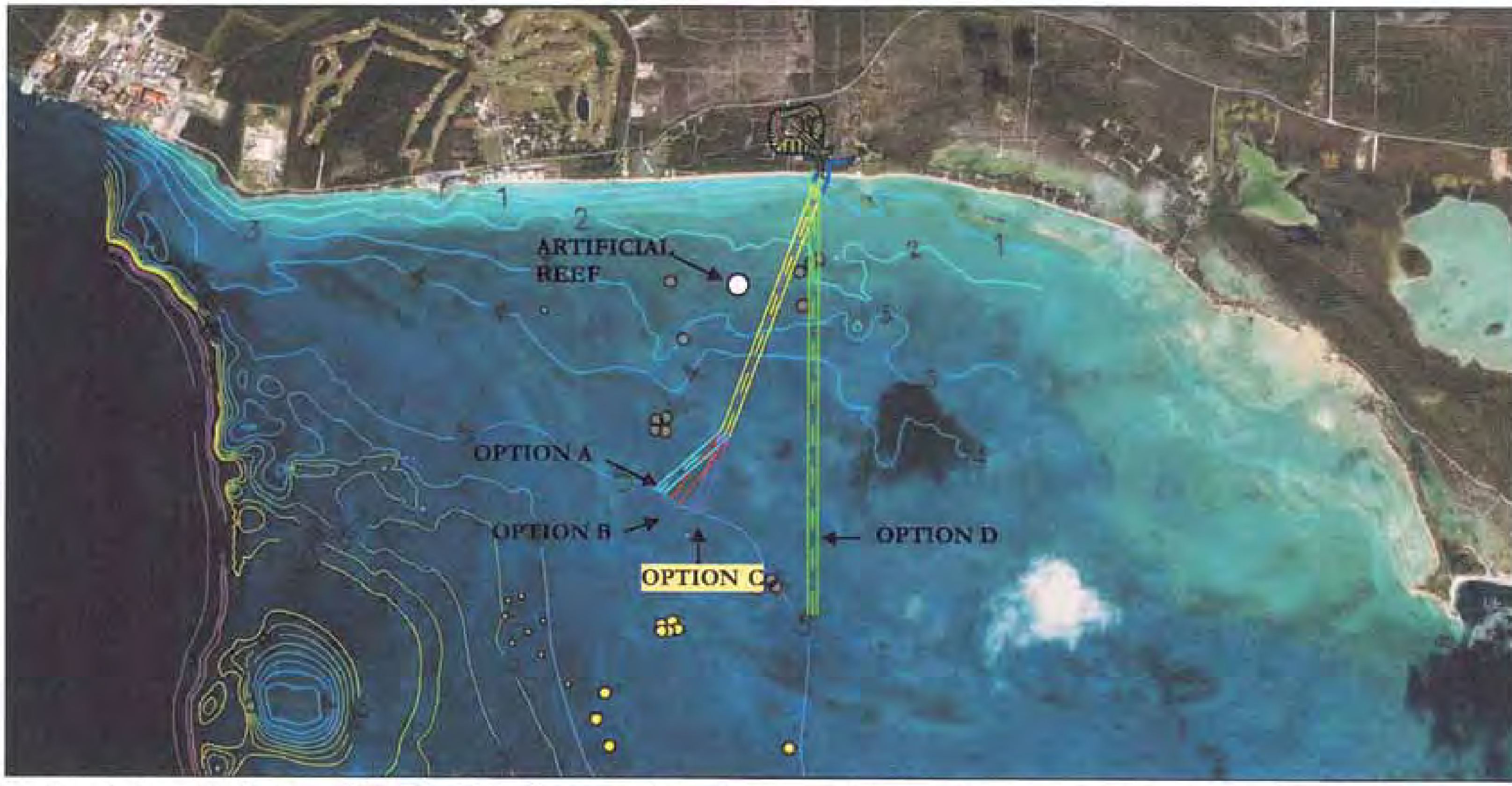
COASTAL SYSTEMS INTERNATIONAL

COASTAL SYSTEMS INTERNATIONAL, INC.
464 South Dixie Highway, Coral Gables, Florida 33146
Tel: 305/661-3655 Fax: 305/661-1914 www.CoastalSystemsIntl.com
STATE OF FLORIDA EB #7007
Coastal, Environmental, Civil Engineering and Management

ALBANY PROJECT
MARINA ENTRANCE CHANNEL

MARINE RESOURCES SURVEY

JOB:	233120	DATE:	01/11/06
BY:	SR	SHEET 1 OF 1	



S

Preferred channel alignment (Option C) and proposed location for reef balls or limestone boulders to create artificial reef.

Figure 6.3 Major Dive Sites in the immediate area

1. Background

The environmental impacts on the costal environment are presented in Appendix II of the EIA for the Albany Development. Section 10 of this report evaluates the impacts of the proposed development on beach stability. The report presents the findings from numerical model simulations and discusses the expected impacts to the shoreline resulting from the proposed channel and jetties. Mitigation measures and monitoring activities are also summarized.

Subsequent to the submission of this EIA document, additional work was carried out with further consideration on the expected shoreline impacts of the channel and jetties. In addition, more specific and detailed mitigation measures were developed in the form of beach nourishment alternatives. This addendum provides a summary of this subsequent work.

2. Sediment Transport and Beach Stability

2.1. Summary of Numerical Modelling Results and Limitations

A numerical (coastal processes and geomorphological) simulation of the Albany and adjacent shorelines was performed during the completion of the Coastal EIA. This simulation involved the modeling of alongshore sediment movement with the aim of quantifying the impacts of disrupting the natural shoreline morphology. The results presented in the above-mentioned document showed that there is a dominant sediment drift from east to west in the vicinity of the marina entrance, and that the net transport rate was predicted to be approximately 1,500 cubic meters per year. These findings indicated that this process would lead to a buildup of sand on the east side of the entrance channel and a corresponding area of erosion on the west side. The results showed a potential 19m of accretion after a period of one (1) year. In this case, "potential" refers to an optimum condition in which there are no limits on sand supply within the active morphological system and there are no artificial mitigative measures after the construction of the channel and jetties.

As sediment movement is driven by the characteristics of the waves that reach the shoreline, the quality of the simulation is determined, to some degree, by the quality of the wave information. Reliable measured long-term (more than 5-years) wave conditions are not available for the south coast of New Providence in a manner that would facilitate the required computations. As such, it was necessary to develop a synthetic wave climate for this work. This was created from a hindcast analysis of wind observations measured at an NDBC (National Data Buoy Center) station (SPGF1) located at Grand Bahama Island. There are, however, inevitable inherent limitations and uncertainties to such an approach, which could be passed on to the results of the numerical simulations. The most relevant uncertainties relate to the magnitude and direction of the generated wave conditions. This would have had a direct impact on the predicted magnitude of the sediment transport rate.

It should also be noted that onsite investigations of the seabed indicate that there is severely limited sand available in the active zone of transport, suggesting that the accretion/erosion potential is unlikely to be filled and as such the actual accretion/erosion rates may be significantly less than the model predictions.

In light of this and given the inherent wave climate related uncertainties, further qualification of the results are provided here, through a review of field observations and a sensitivity analysis.

Implications of Field Observations

In 1967, a detached breakwater or artificial reef was constructed offshore to the immediate east of the Albany shoreline (Figure 1). As was indicated in the Coastal EIA and, as can be observed in the figure below, the shoreline landward of the artificial reef system has protruded seaward (20-30m) as a direct consequence of the construction of this breakwater. The nearshore area is also shallower in this area. This build up typically happens behind these types of structures and is evidence to the fact that there is alongshore movement of sand. Based on the observed approximate build-up, it is estimated that there has been between 0.6m to 0.8m of accretion per year.

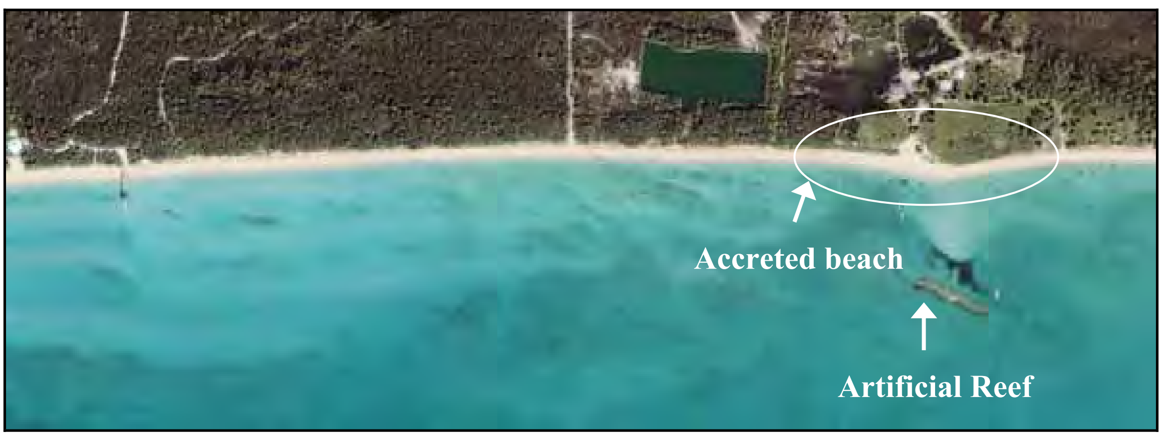


Figure 1: Artificial Reefs and Sandbars in the nearshore zone, Albany Development

Consequently, this feature confirms that there will be a build up of sand on either side of the inlet jetties after construction. However, the rate of build up is likely to be greater than what occurred behind this breakwater for a number of reasons: i) the impact on sediment movement has been limited by its relatively large distance from the shoreline in relation to its length; ii) the breakwater does not cause full blockage of sediment movement, while the proposed jetty structures will block most of the alongshore sediment movement; and iii) the orientation of the breakwater relative to the shoreline and the approaching wave angles is not optimum to promote sediment accumulation in its lee.

2.2. Sensitivity Analysis

The above discussions show that while the limitations of the approach taken to simulate alongshore sediment movement may not allow for definitive quantification of the impacts on the shoreline, the observations do provide some justification for the expected impacts, at least on a qualitative basis. In order to support these conclusions, a sensitivity analysis was carried out, to evaluate the likely range of possible shoreline response to varying inputs of wave climate and limited sediment supply.

A parametric approach was adopted to carry out this analysis. The formula used to derive the rate of accretion against a shore-perpendicular structure (similar in nature to the entrance jetties) is given in the Coastal Engineering Manual as presented below:

$$Accretion = 2\sqrt{\frac{tQ\tan\alpha}{\pi d}}$$

where: t is time since construction of jetty;

Q is the estimated annual sediment transport rate;

α is the average wave angle upon breaking; and

d is the average depth at which waves break.

The results of the synthetic wave climate indicated the following values:

Annual sediment transport rate (Q) = 1,500 cubic meters per year

Breaking wave angle of (α) = 13 degrees

Average breaking depth (d) = 1.2m

Given the uncertainties in the wave characteristics, the breaking wave angle and sediment transport rate were varied to examine the sensitivity of the results to these values. The results are presented following in Figures 2 and 3.

Figures 2 and 3 show the temporal variation in accretion for different rates of annual sediment transport. Figure 2 presents the results based on the wave angles derived from the synthetic wave climate (α = 13 degrees, relative to the shoreline orientation) while the second uses an assumed smaller wave angle (α = 5 degrees, relative to the shoreline orientation).

For a transport rate of Q=1,500 cubic meters/year and a breaking wave angle of α = 13 degrees, the results of the sensitivity analysis presented in Figure 2 show rates similar to those found in the numerical simulations performed with the synthetic wave climate, therefore supporting the application of the sediment transport model (Genesis). However, if a smaller breaking wave angle is assumed (α = 5 degrees), the results of the sensitivity analysis as presented in Figure 3, suggest a reduced rate of accretion against the jetty structure in comparison with the results for the larger breaking wave angle. If the actual sediment transport rate is one-third of the synthetic predictions, due to limitations in sand supply, there will be approximately 8 m of accretion after the first year for a breaking wave angle of 5 degrees.

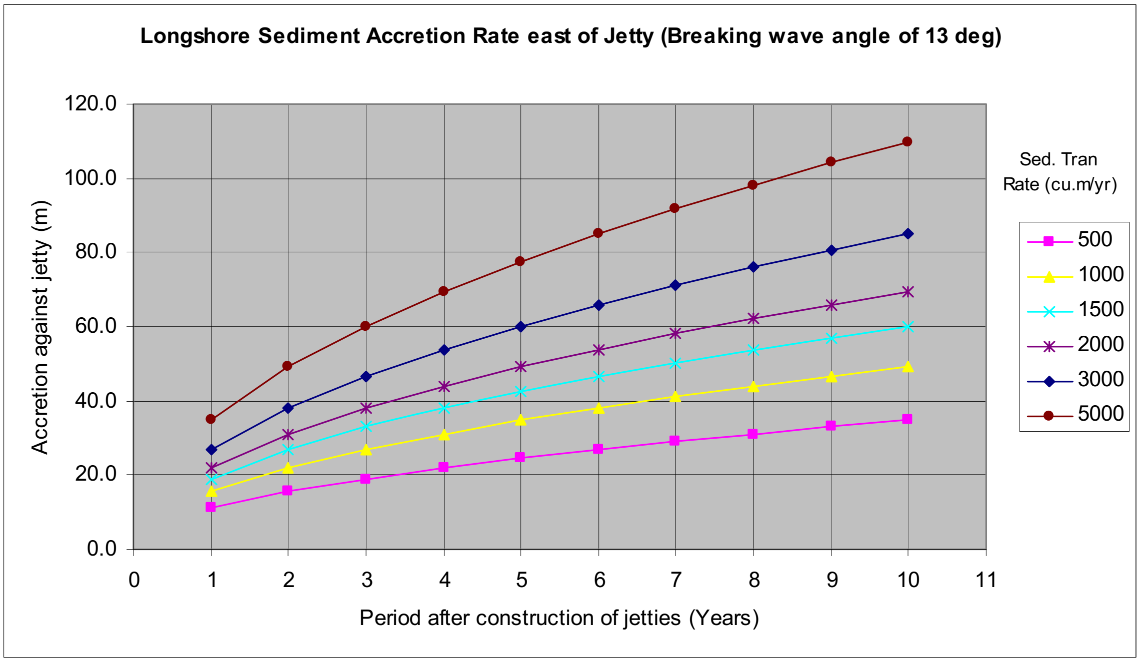


Figure 2: Shoreline accretion scenarios for oblique wave angle

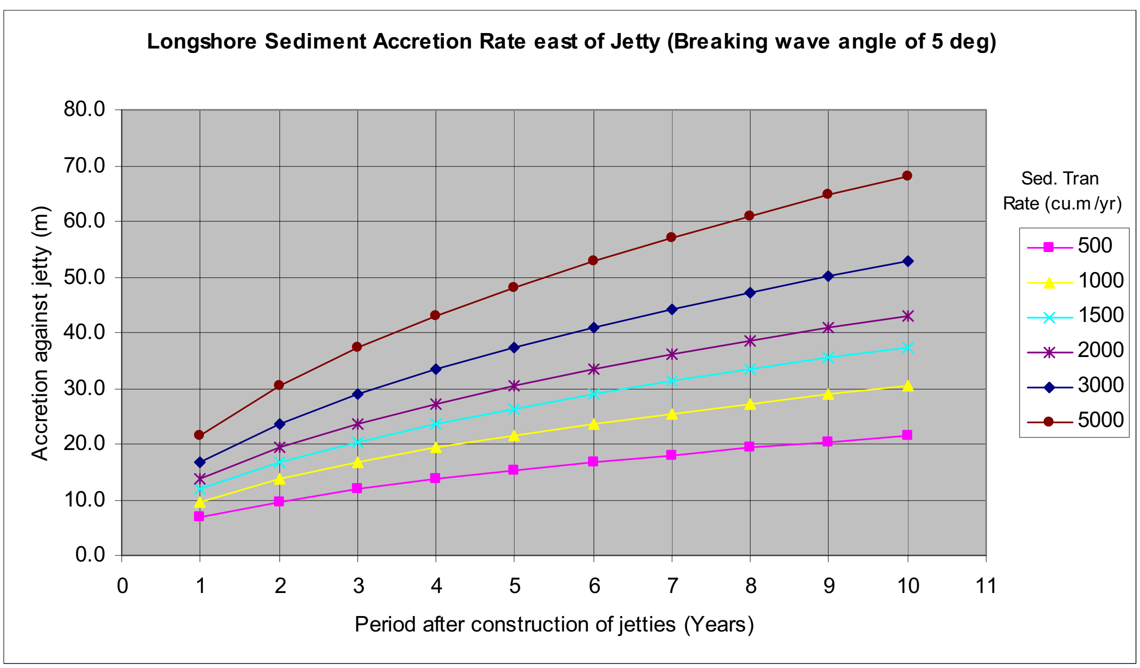


Figure 3: Shoreline accretion scenarios for less oblique wave angle

Essentially, the results indicate that there will be approximately 8 to 10 m of accretion after the first year of construction of the jetties, with subsequent annual accretion rates of approximately 1.2 m/year. Accretion on the east side will lead to corresponding erosion on the west side of the jetties. The effects of these impacts are not expected to extend beyond 750 m east or west of the proposed jetties and channel, as predicted by the GENESIS modeling previously carried out.

2.3. Impact of Storm waves

While the analysis has focused on the impacts of day-to-day wave conditions on shoreline morphology, the infrequent occurrence of waves from storms will have a significant impact on sediment movement patterns along the shoreline. The magnitude of the impact will depend on the direction and magnitude of waves generated in a storm.

A storm may result in the movement of sand along and across the shoreline, leading to erosion in some areas and possibly accretion in others. Sand which is brought offshore under these conditions is expected to return by natural processes, as the beach seeks to retain its original equilibrium. Sand transport to the east may also cause a build up of sand along the west side of the jetty, contrary to expectations from the day-to-day conditions.

2.4. Discussion

Despite the uncertainties inherent in the predictions of shoreline response, the sensitivity analysis has demonstrated that there will be some degree of accretion on the east side of the jetty and channel. As the frequency, magnitude and approach direction of storms vary from year to year, it is difficult to quantify the expected impacts. It is however important to be aware of the possibilities and to make adequate preparations for their impacts.

In the event that sand is transported from the east to the west, then accretion of sand against the eastern side of the channel jetties will lead to erosion on the west side of the channel. This movement in sand may also cause a slight erosion along the Adelaide shoreline. If sand is transported from west to east, then there will be a reverse effect on the shoreline, with some impact on the Adelaide shoreline.

In light of these findings, the it has been recommended to the developers to mitigate against the likely impacts on the shoreline with extensive beach nourishment of the adjacent shoreline and subsequent monitoring and maintenance of these beaches. The details of this proposal are provided in the following section.

3. Beach Enhancement

It has been recommended that the developers nourish the adjacent beach areas east and west of the channel as a mitigation strategy against the expected shoreline changes. It is therefore being proposed to increase the width of the beach on both sides of the channel. The attached drawing illustrates the extent of the proposed nourishment plan.

Nourishment on the western side of the channel will be carried out within the boundaries of the Albany property. An increase in beach width of 15m (50ft) is being proposed.

On the eastern side, the enhancement will take place in three areas within a distance of 2060m (6600 ft) from the channel:

- Increase in beach width of 15m (50 ft) over a distance of 720 m (2300 ft) along the shoreline immediately east of the channel.
- Creation of a 15 m (50 ft) wide beach for public usage over a distance of 620m (2000 ft) at the eastern end of the proposed area for nourishment.
- Increase in beach width of 4.5 m (15ft) over a distance of 720 m (2300 ft) between the other two areas for nourishment.

The proposed nourishment plan is intended to offset any expected shoreline changes before they occur naturally. By placing sand east and west of both jetties, there will be minimal movement of sand from the adjacent beach areas, thus reducing any negative impacts on the adjacent areas. In addition, any movement of sand away from the nourished areas should only reduce the beach width to the level of their current state. The beach is anchored by two breakwater structures shown on the drawing.

The creation of a wide public beach area will be beneficial to the Adelaide and surrounding communities. The overall beach nourishment plan will alleviate any negative perceptions of erosion along the beaches adjacent to the Albany development following the construction of the channel and jetties.

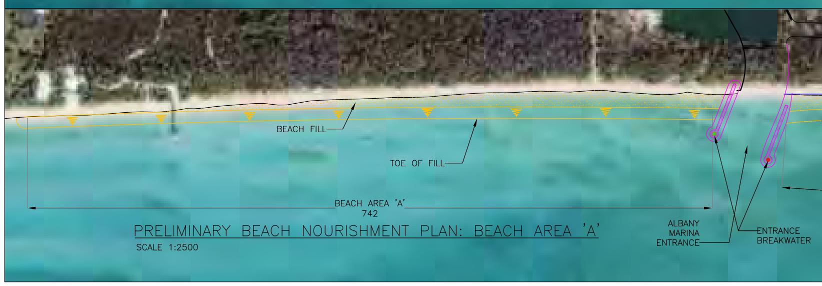
The total volume of sand required to nourish on the east side of the channel is 40,000 cubic yards and a total of 20,000 cubic yard is required along the Albany shoreline. An offshore sand source has been identified offshore some 3 to 4 miles southeast of Albany. The sand from this area will be dredged and pumped directly to the beach.

3.1. Monitoring and Renourishment

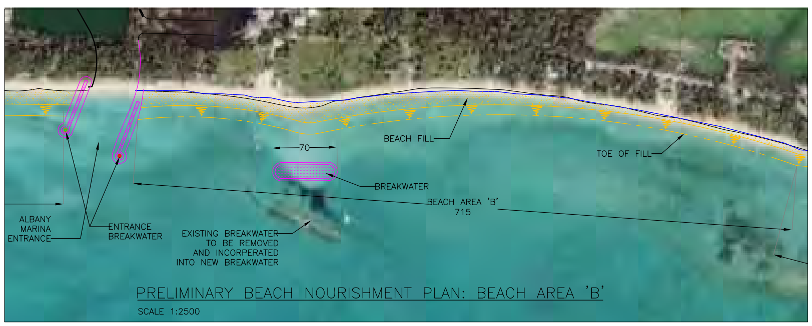
In addition to this initial nourishment plan, it is proposed that the developers carry out a sustained monitoring program of the beaches being proposed for nourishment. Beach profiles should be taken at the same locations along the entire shoreline once every three months during the first two years, and once every six months for the following three years. After the first two years, the plan could be reduced to semi-annual measurements of beach profiles. The profiles should be spaced at 100 m intervals along the beach, excepting 200 m immediately east and west of the jetties, where profiles should be taken at 25 m spacing.

This monitoring program will inform the developers of changes in the shoreline and the impacts of any storm events. This information should then be used to instruct the need for additional nourishment. Sand required for renourishment may either be taken from the source identified offshore or from approved sources from alternate upland or offshore locations.

PRELIMINARY MASTER PLAN
SCALE 1:5000

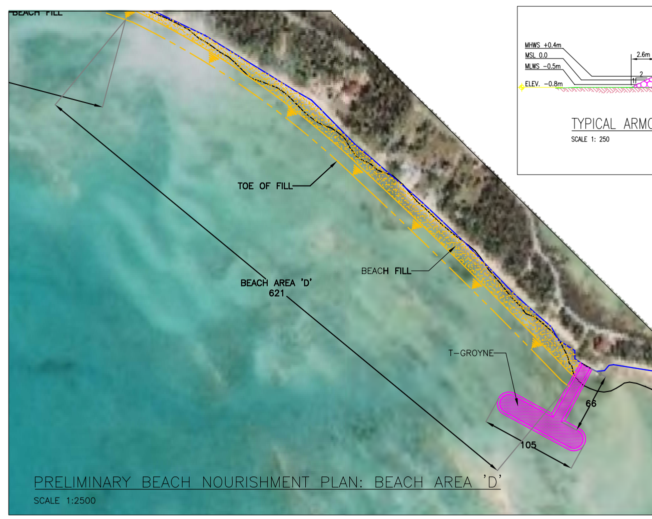


PRELIMINARY BEACH NOURISHMENT PLAN: BEACH AREA 'A'
SCALE 1:2500

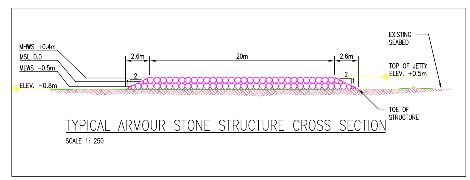


PRELIMINARY BEACH NOURISHMENT PLAN: BEACH AREA 'B'
SCALE 1:2500

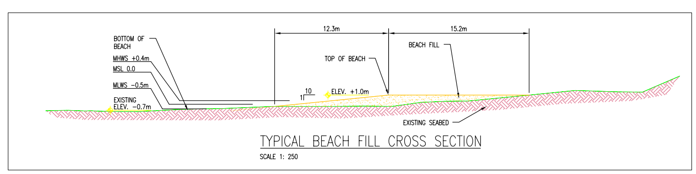
PRELIMINARY BEACH NOURISHMENT PLAN: BEACH AREA 'C'
SCALE 1:2500



PRELIMINARY BEACH NOURISHMENT PLAN: BEACH AREA 'D'
SCALE 1:2500



TYPICAL ARMOUR STONE STRUCTURE CROSS SECTION
SCALE 1: 250



TYPICAL BEACH FILL CROSS SECTION
SCALE 1: 250

NOTE

1). All dimensions and elevations are in meters unless otherwise stated.

rev.	description	date
01	issued for client review	18-01-06

project title
ALBANY DEVELOPMENT, NEW PROVIDENCE, BAHAMAS

client
RIDGEFIELD HOLDINGS LTD.

drawing title
PRELIMINARY PLANS & TYPICAL CROSS-SECTIONS

Unit 2, Seymour Park, 2 Seymour Avenue
Kingston 10, Jamaica, W.I.
Tel: (876)978-8950 | (876)978-7415
Fax: (876)978-0665

drawn	Roberto Lyn	Oct. '05	drawing no.
checked	Rodney Poulin	Oct. '05	SWIL-AD02
scale	AS SHOWN	sheet no. 1 of 1	

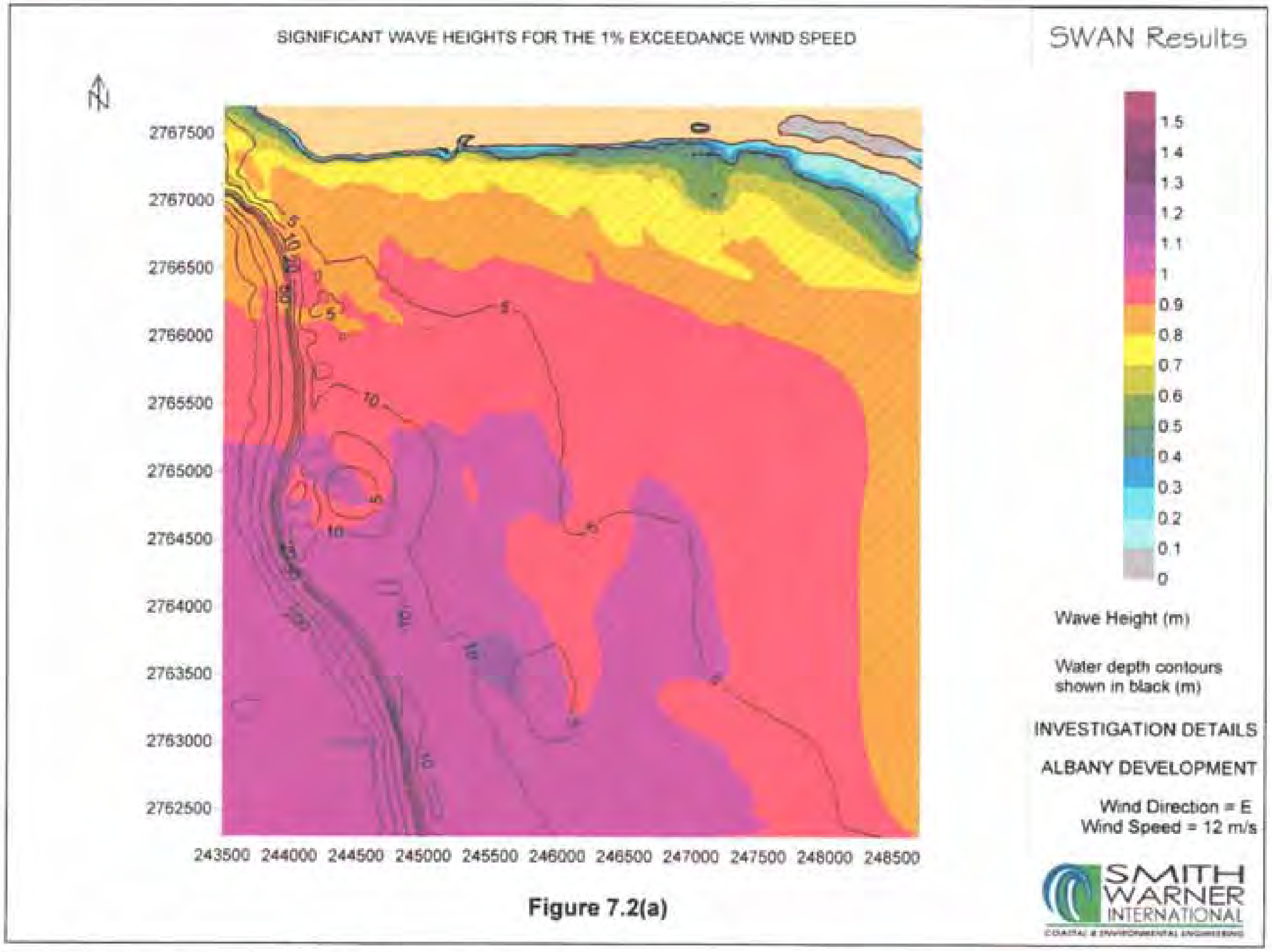


Figure 7.2 Two-dimensional plots of 1% exceedance wind-waves coming from the east (without entrance structures)

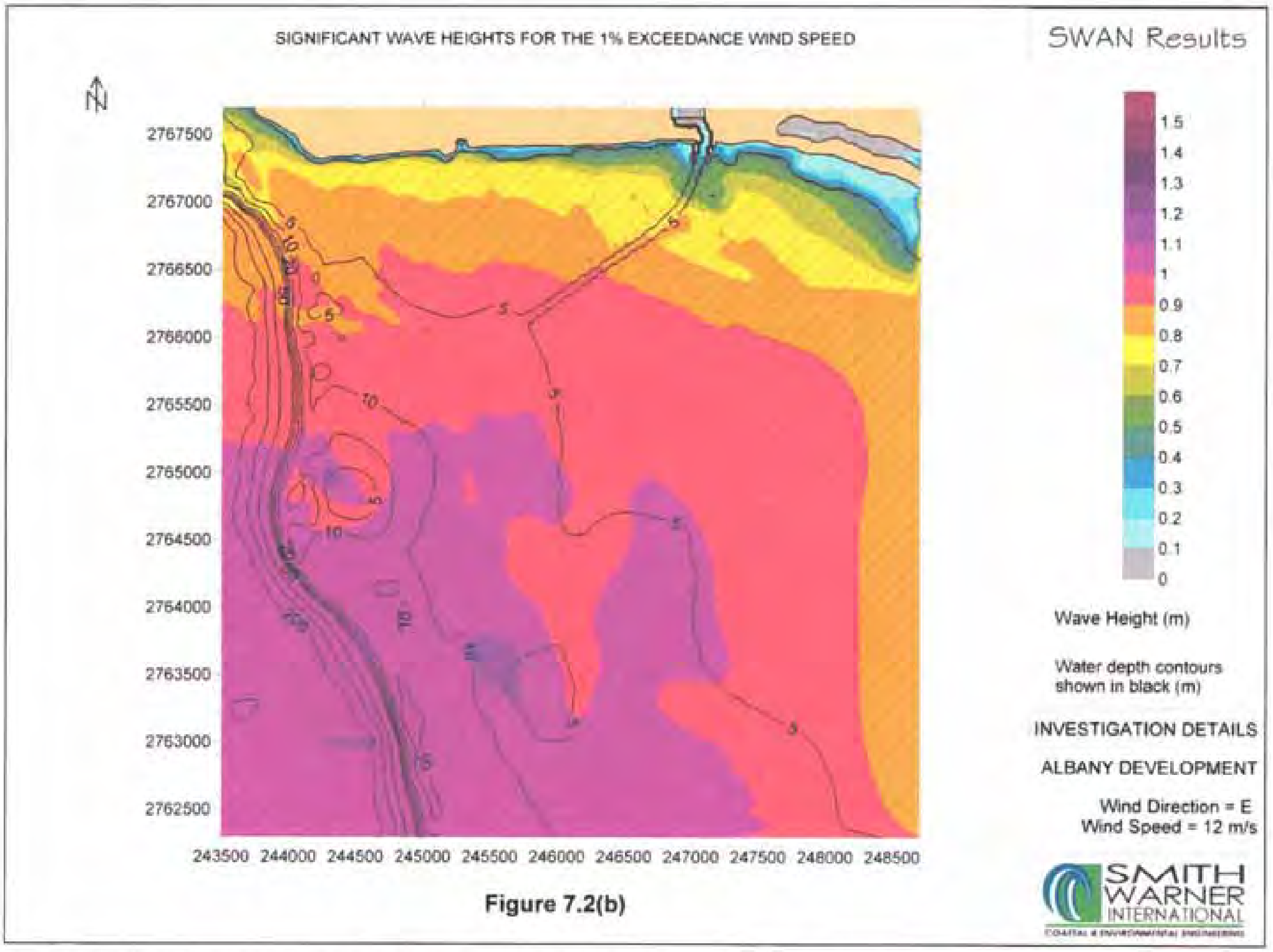


Figure 7.2(b)

Figure 7.2 Two-dimensional plots of 1% exceedance wind-waves coming from the east (with entrance structures)

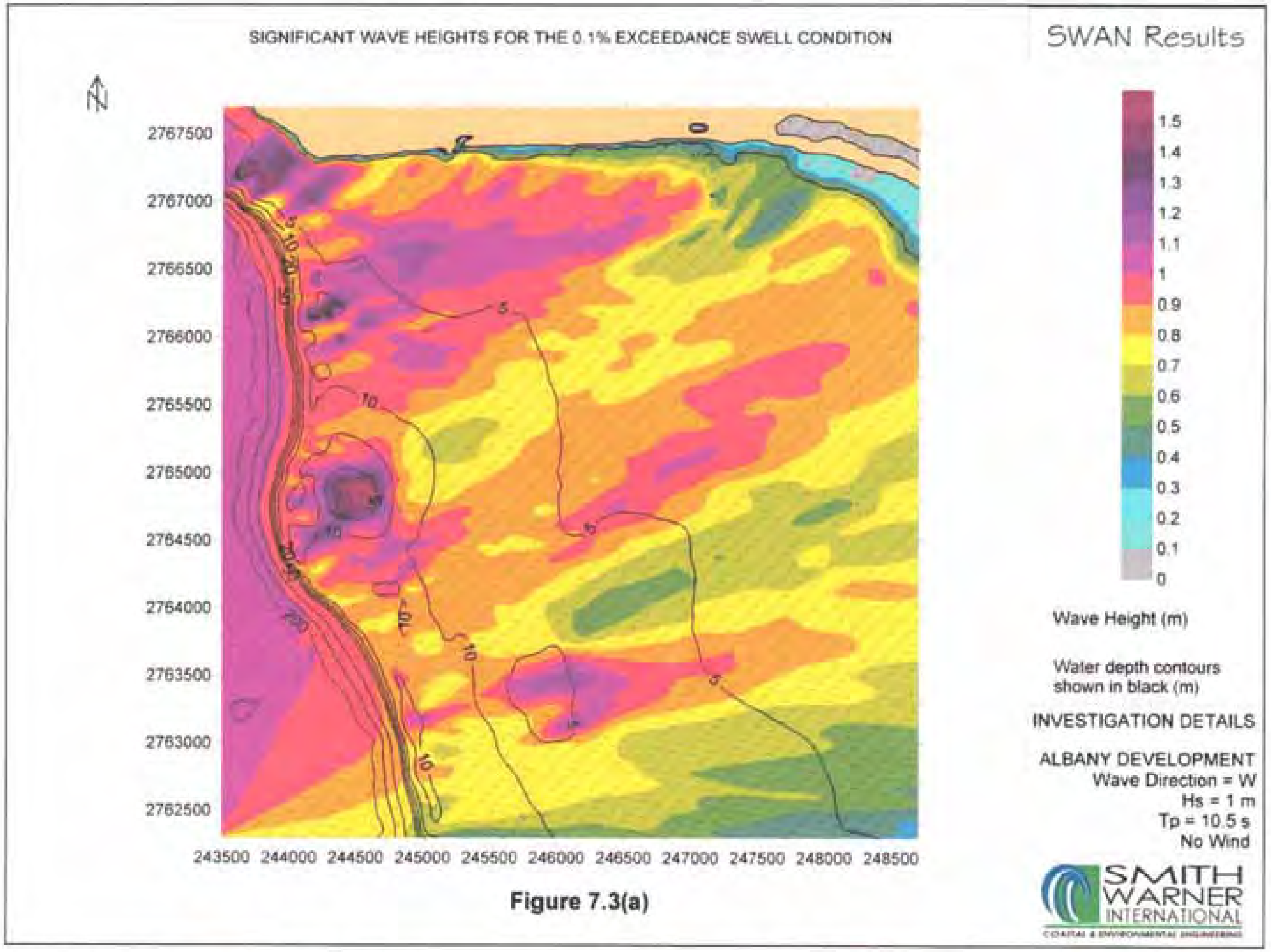


Figure 7.3(a)

Figure7.3 Two-dimensional plots of 0.1% exceedance swell waves coming from the west (without entrance structures)

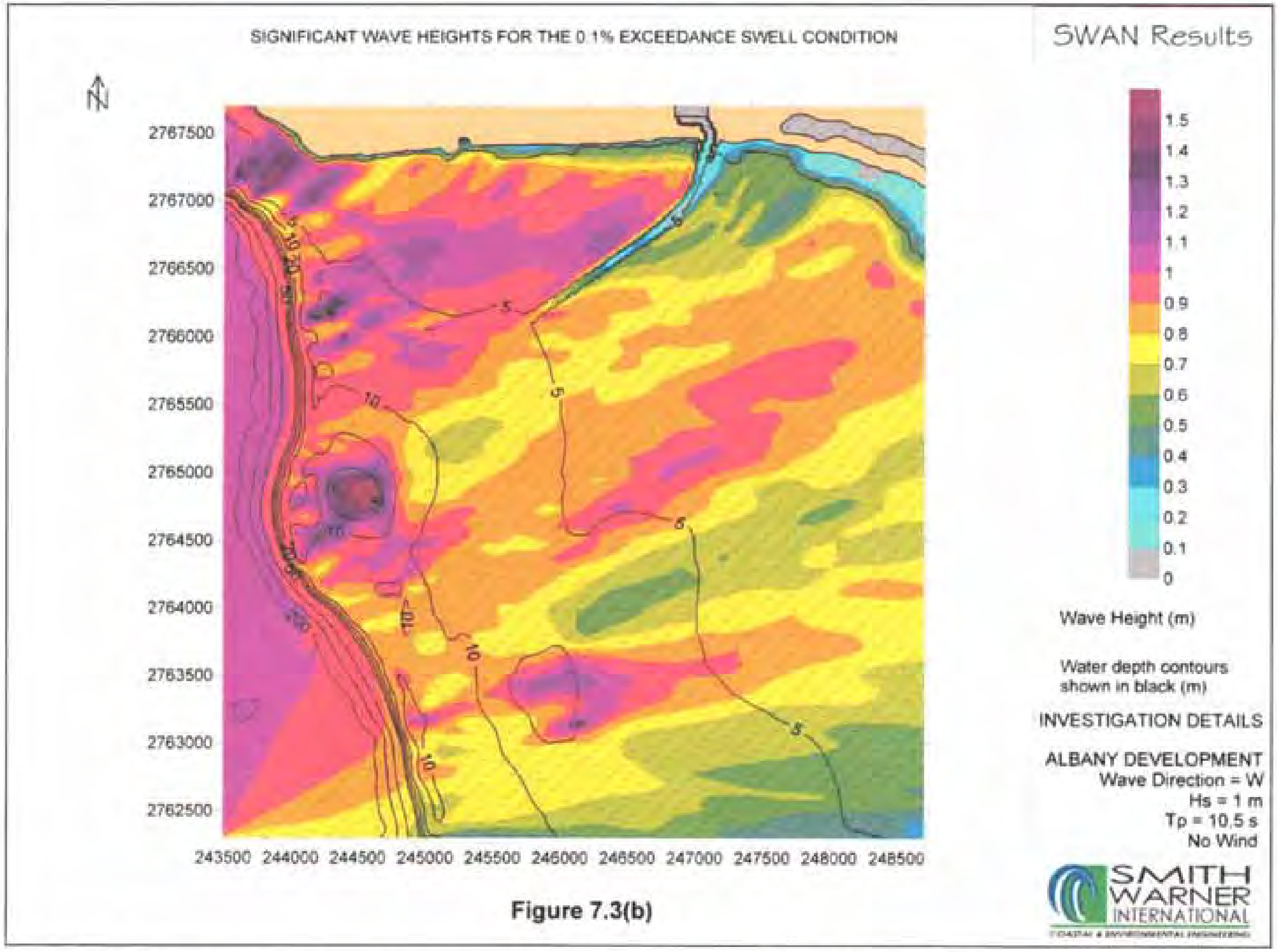


Figure 7.3 Two-dimensional plots of 0.1% exceedance swell waves coming from the west (with entrance structures)

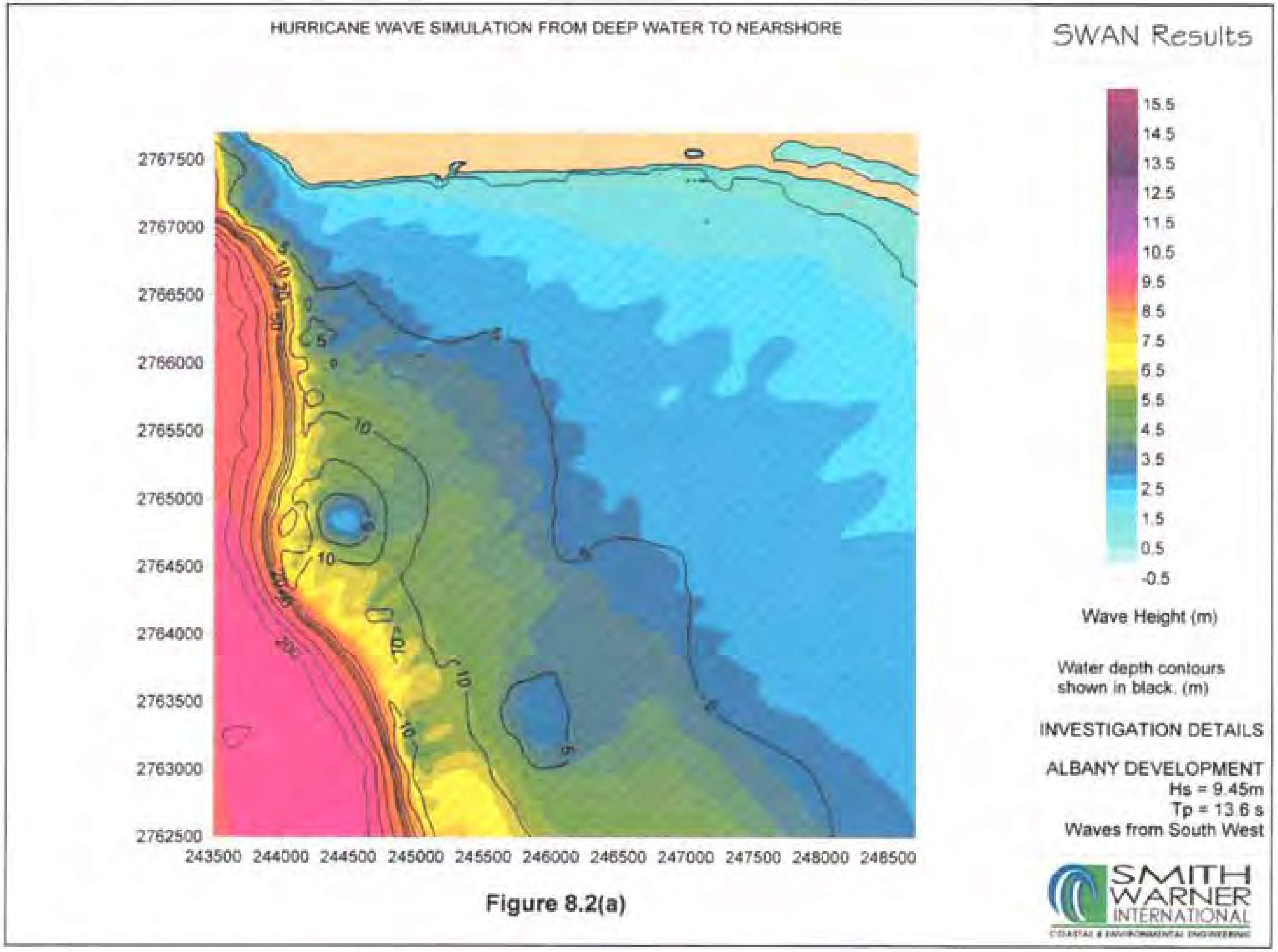


Figure 8.2 50-year hurricane wave heights (without entrance structures)

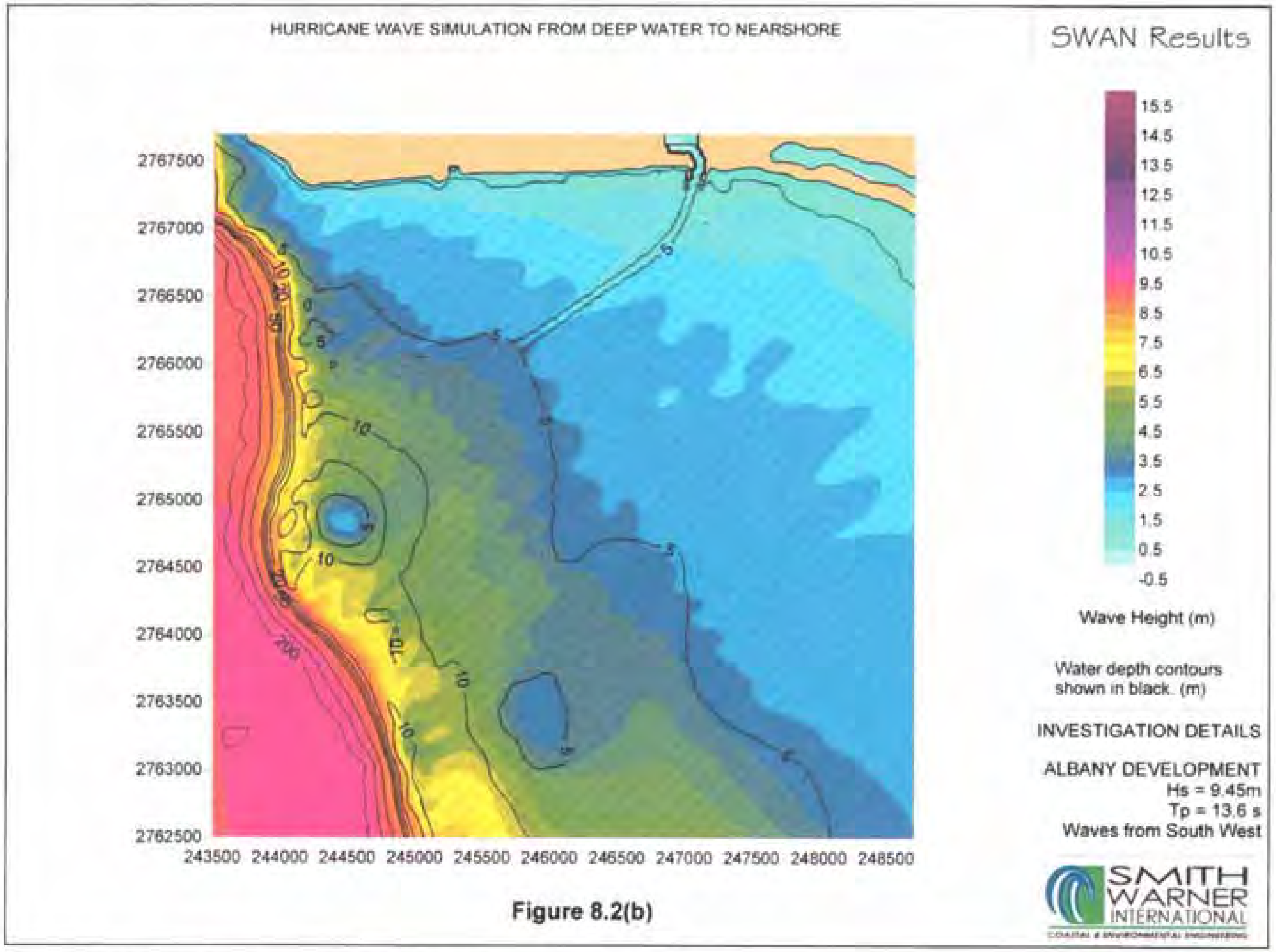


Figure 8.2 50-year hurricane wave heights (with entrance structures)

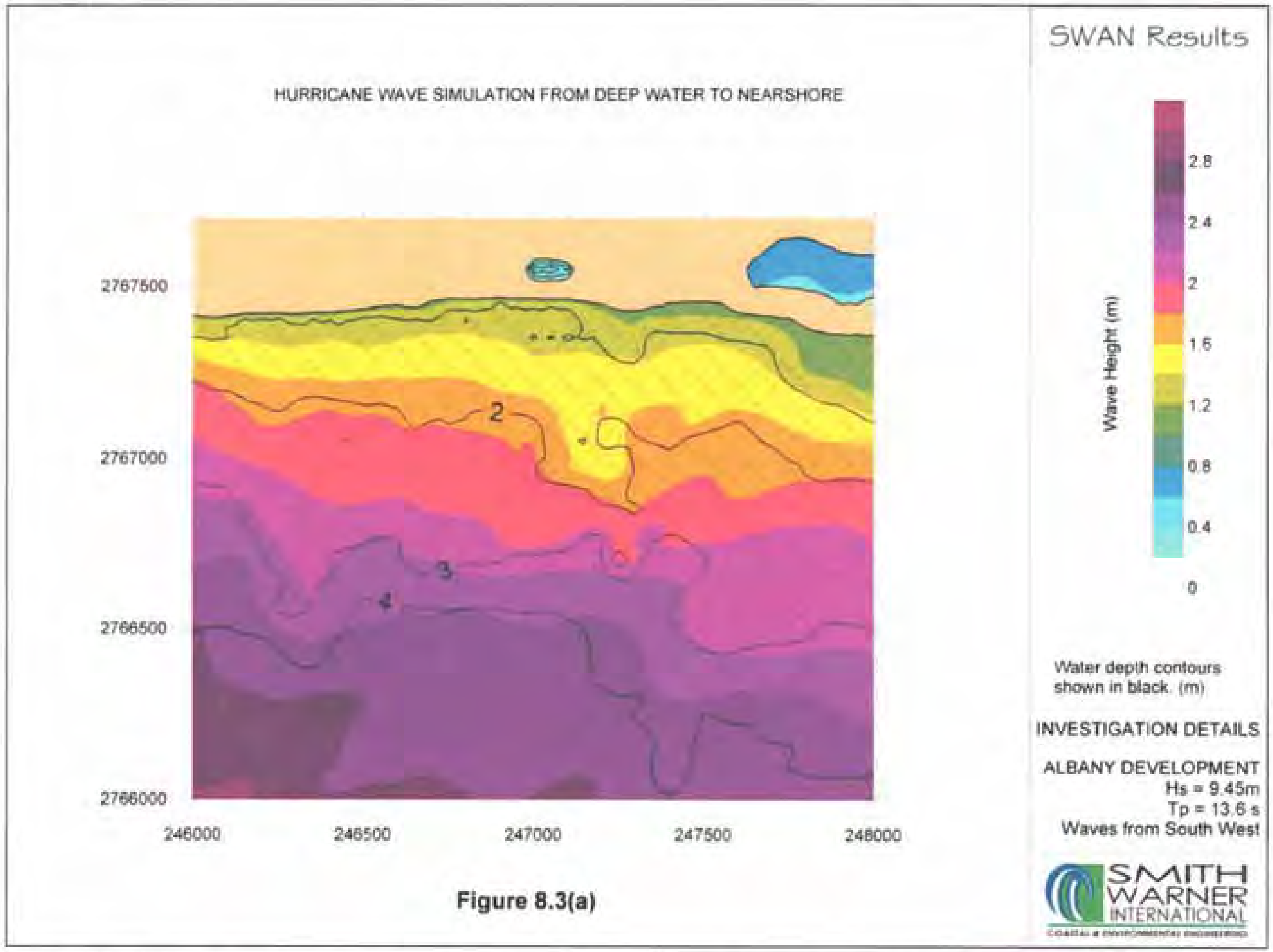


Figure 8.3 50-year hurricane wave heights at the marina entrance area (without entrance structures)

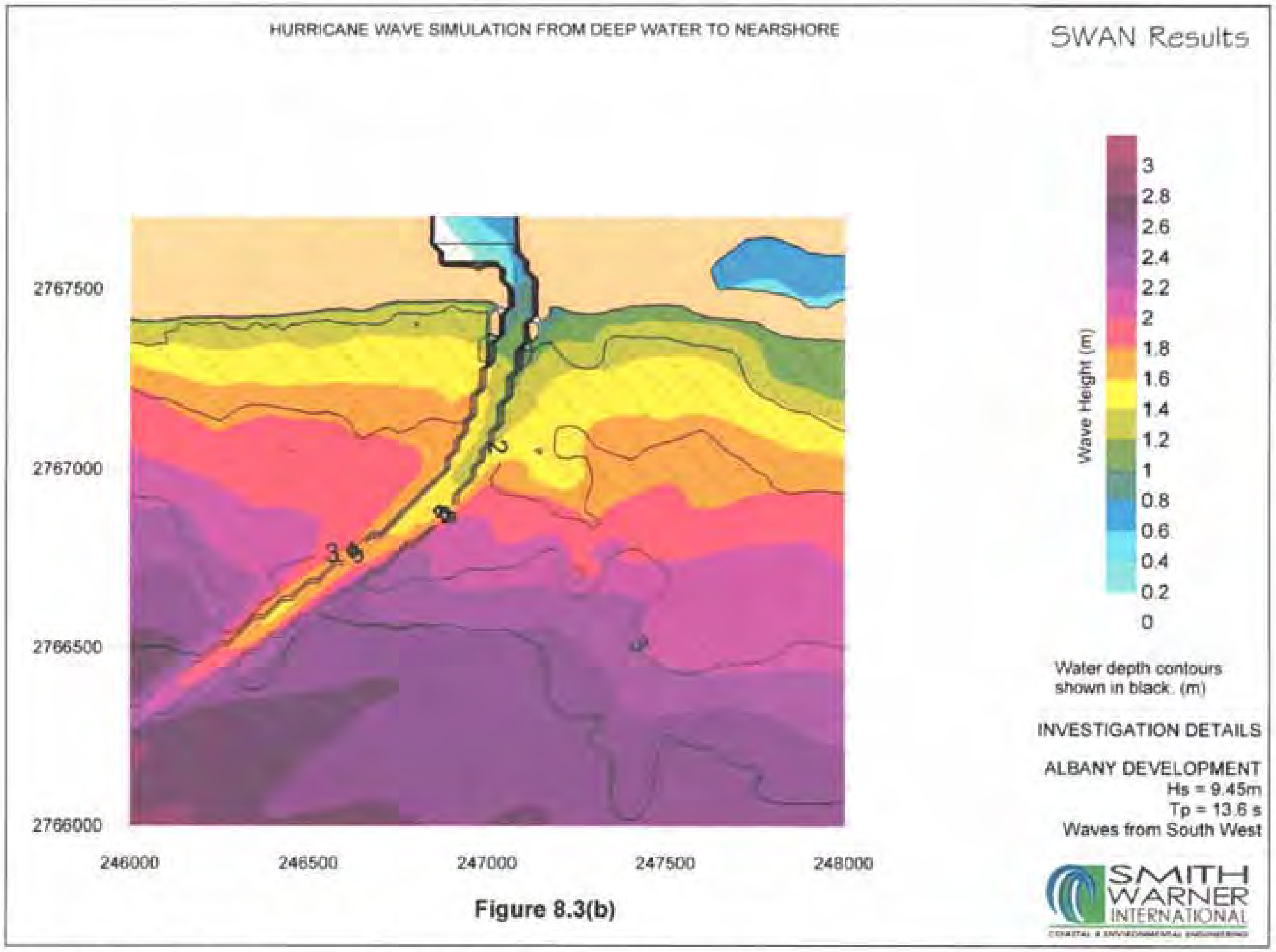


Figure 8.3 50-year hurricane wave heights at the marina entrance area (with entrance structures)

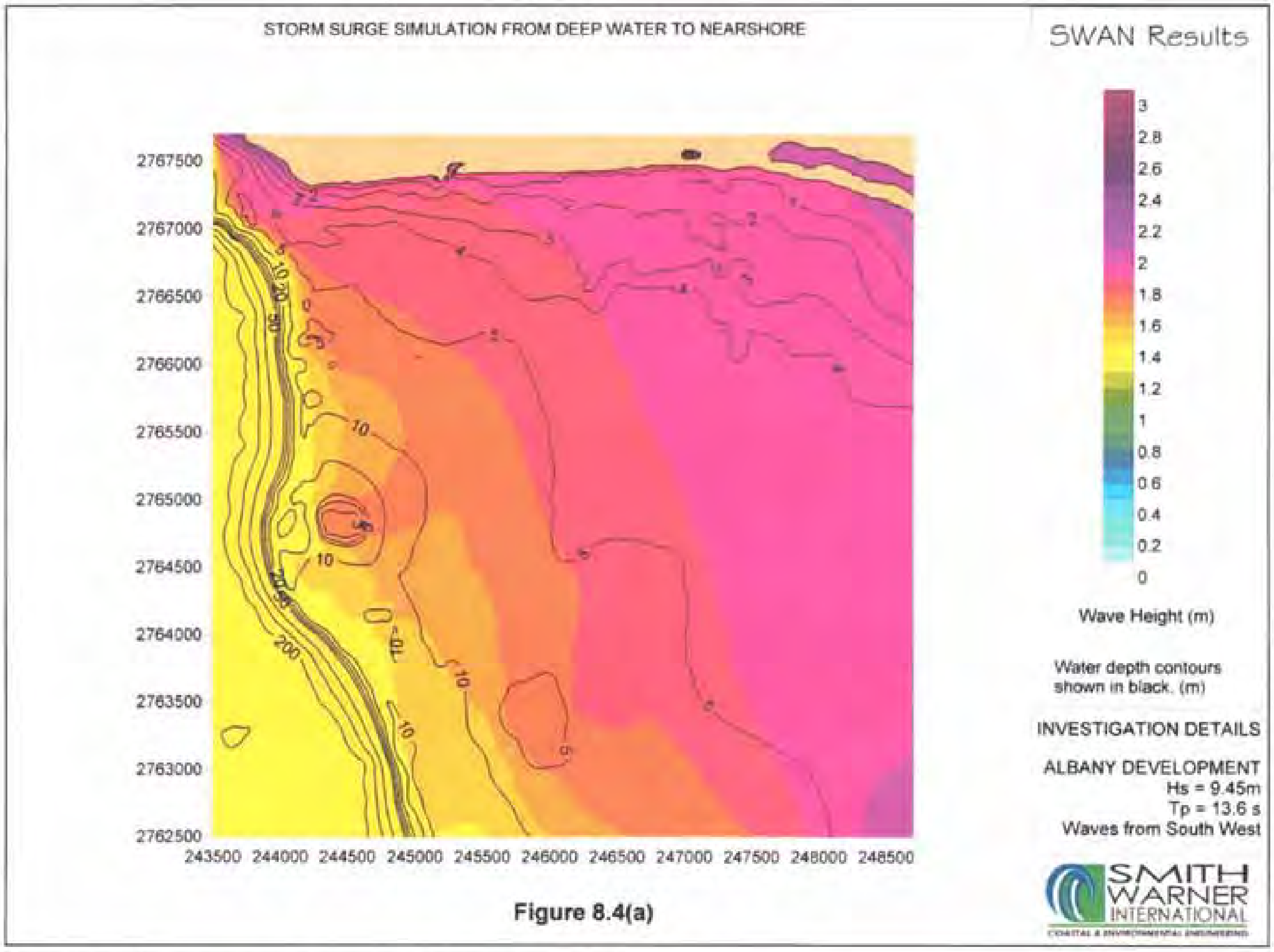


Figure 8.4 50-year hurricane storm surge (without entrance structures)

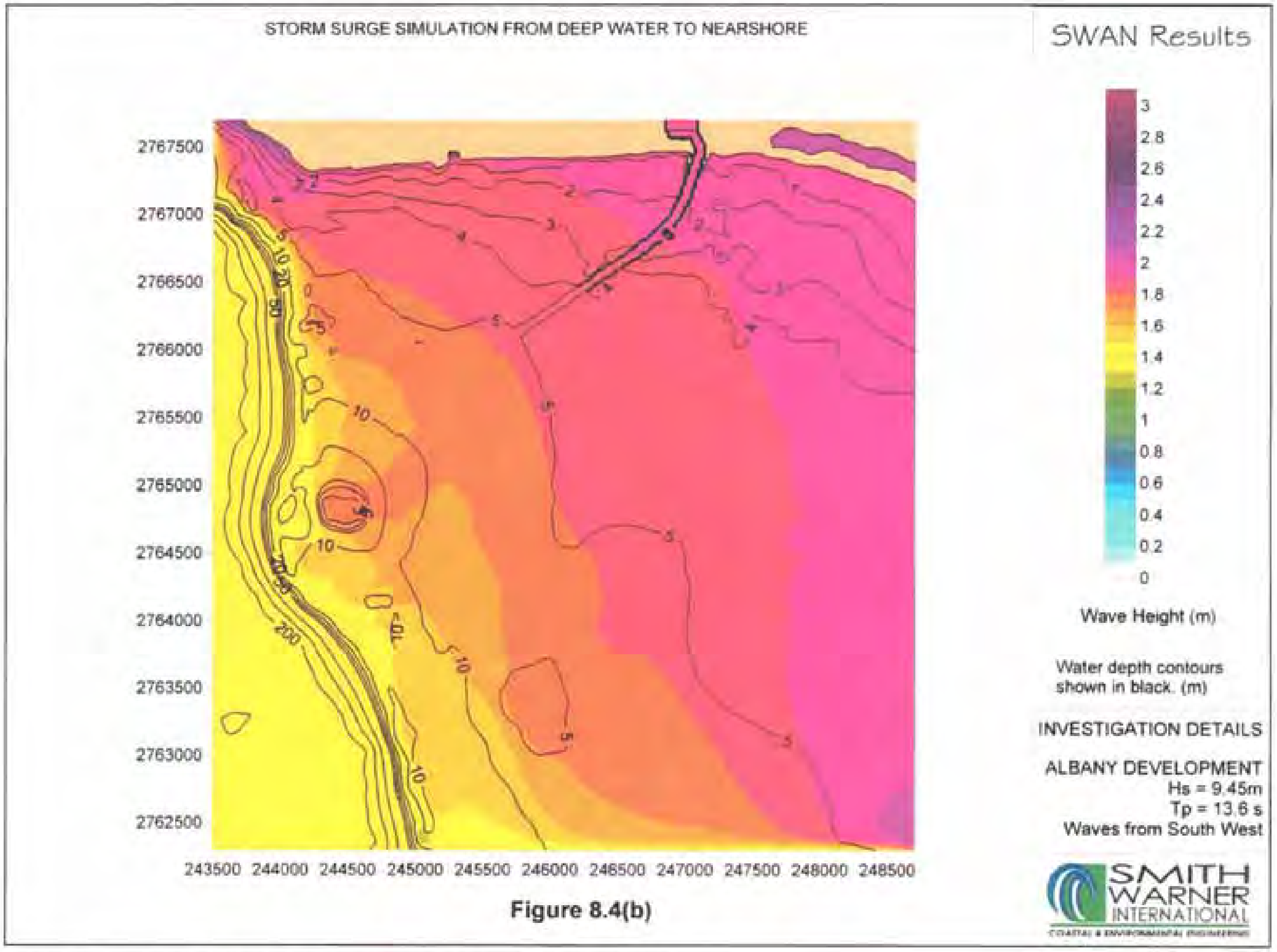


Figure 8.4 50-year hurricane storm surge (with entrance structures)

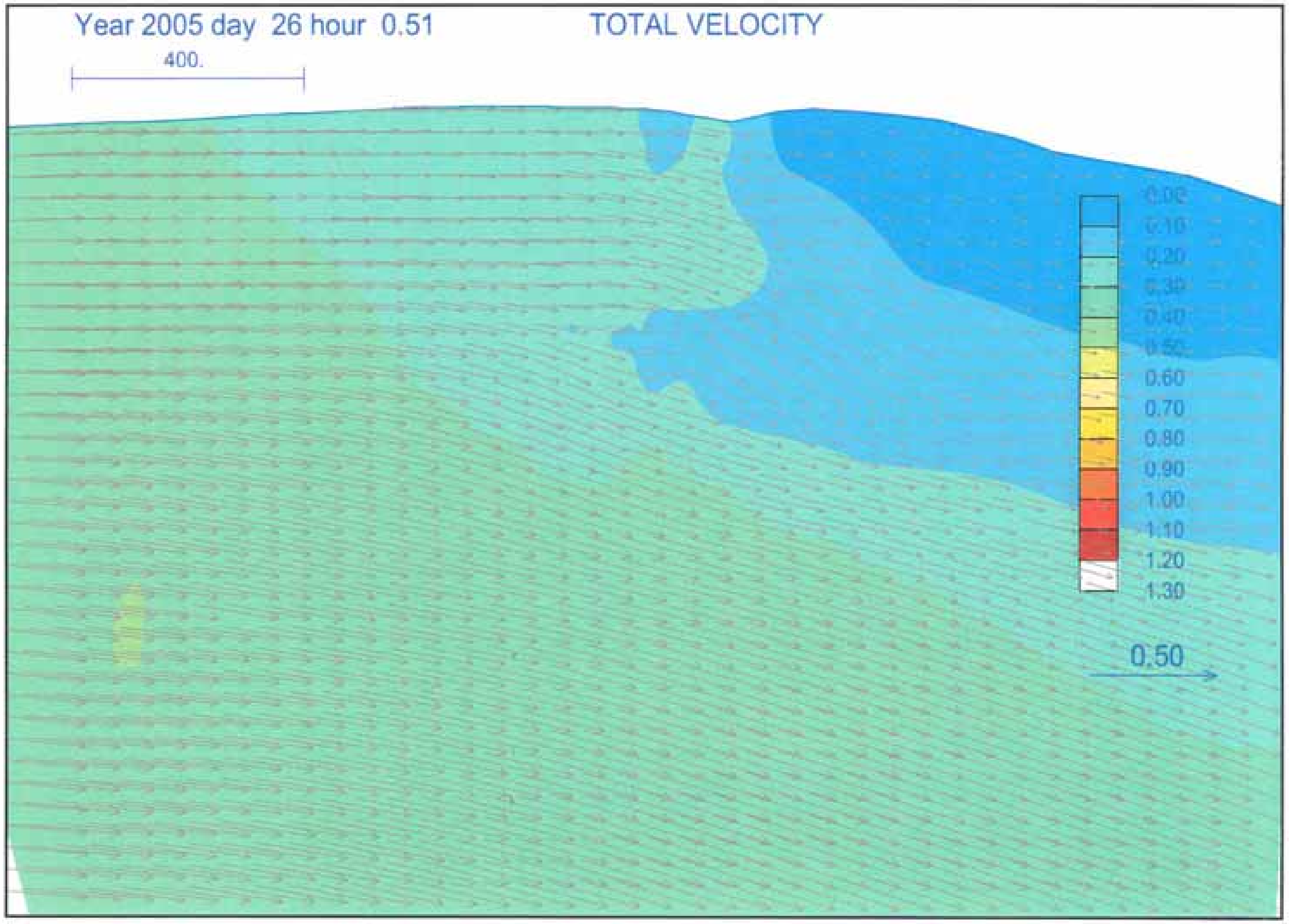


Figure 9.3 Current patterns during rising tide (Existing scenario)

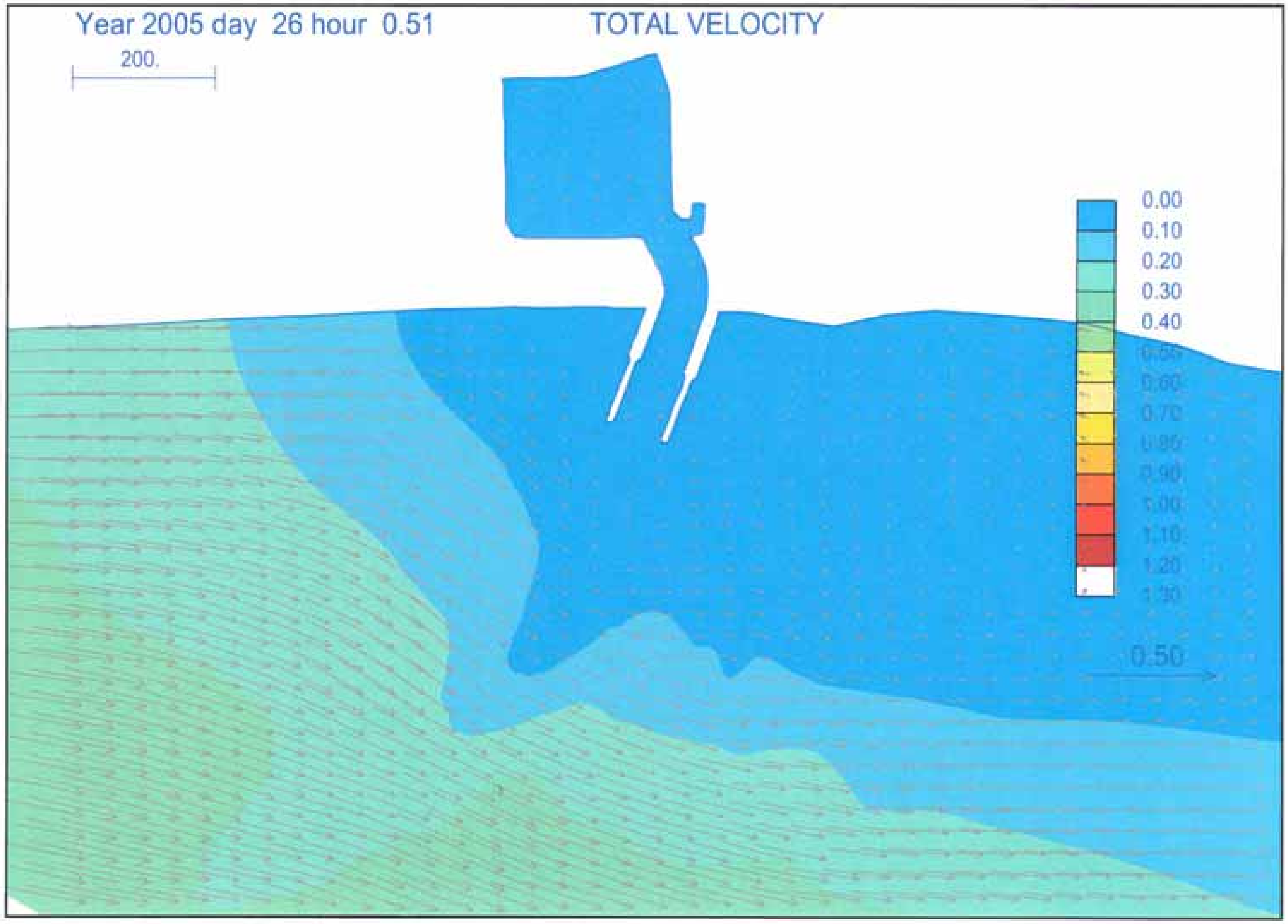


Figure 9.3 Current patterns during rising tide (Projected scenario)

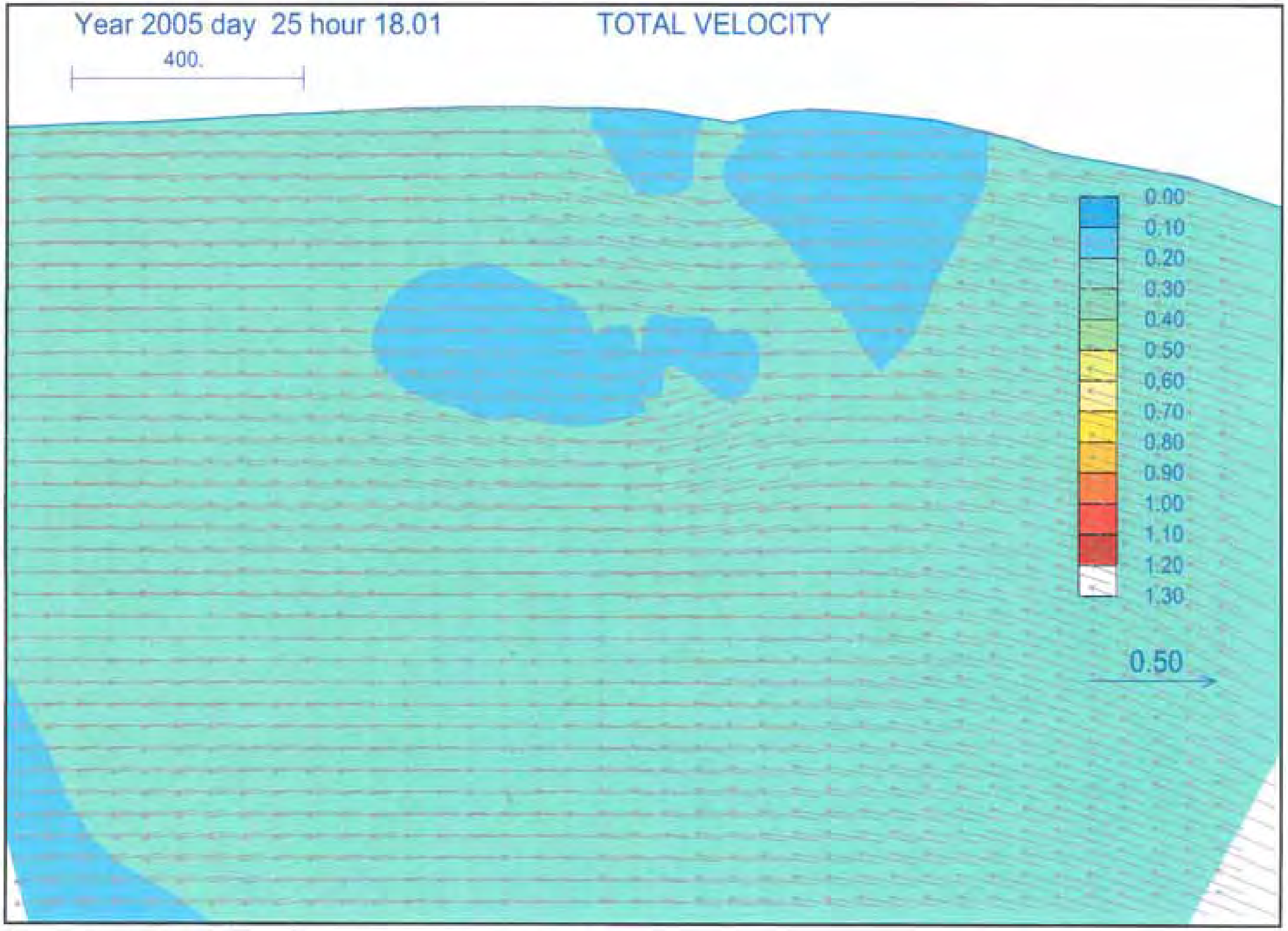


Figure 9.4 Current patterns during falling tide (existing scenario)

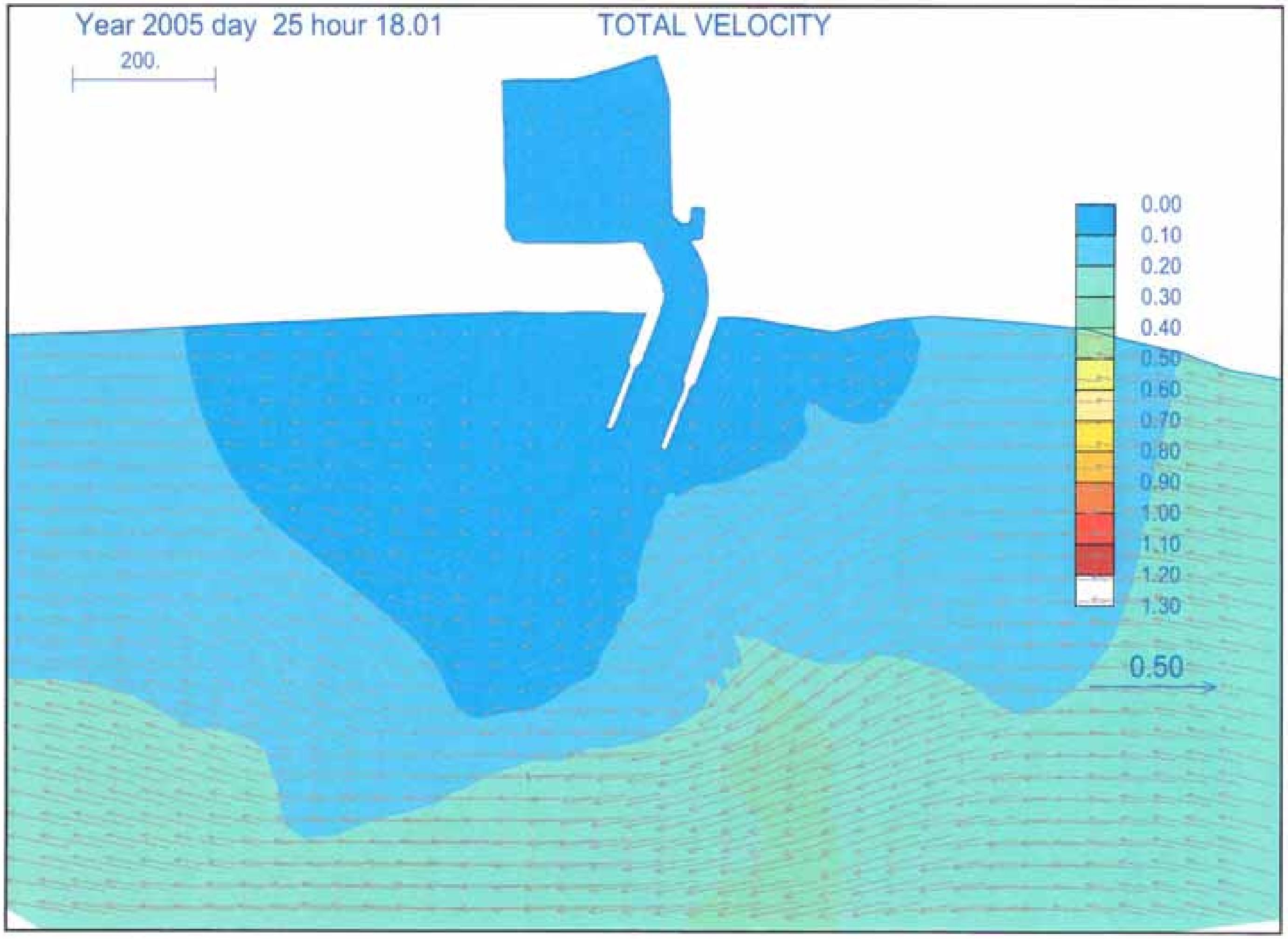


Figure 9.4 Current patterns during falling tide (projected scenario)

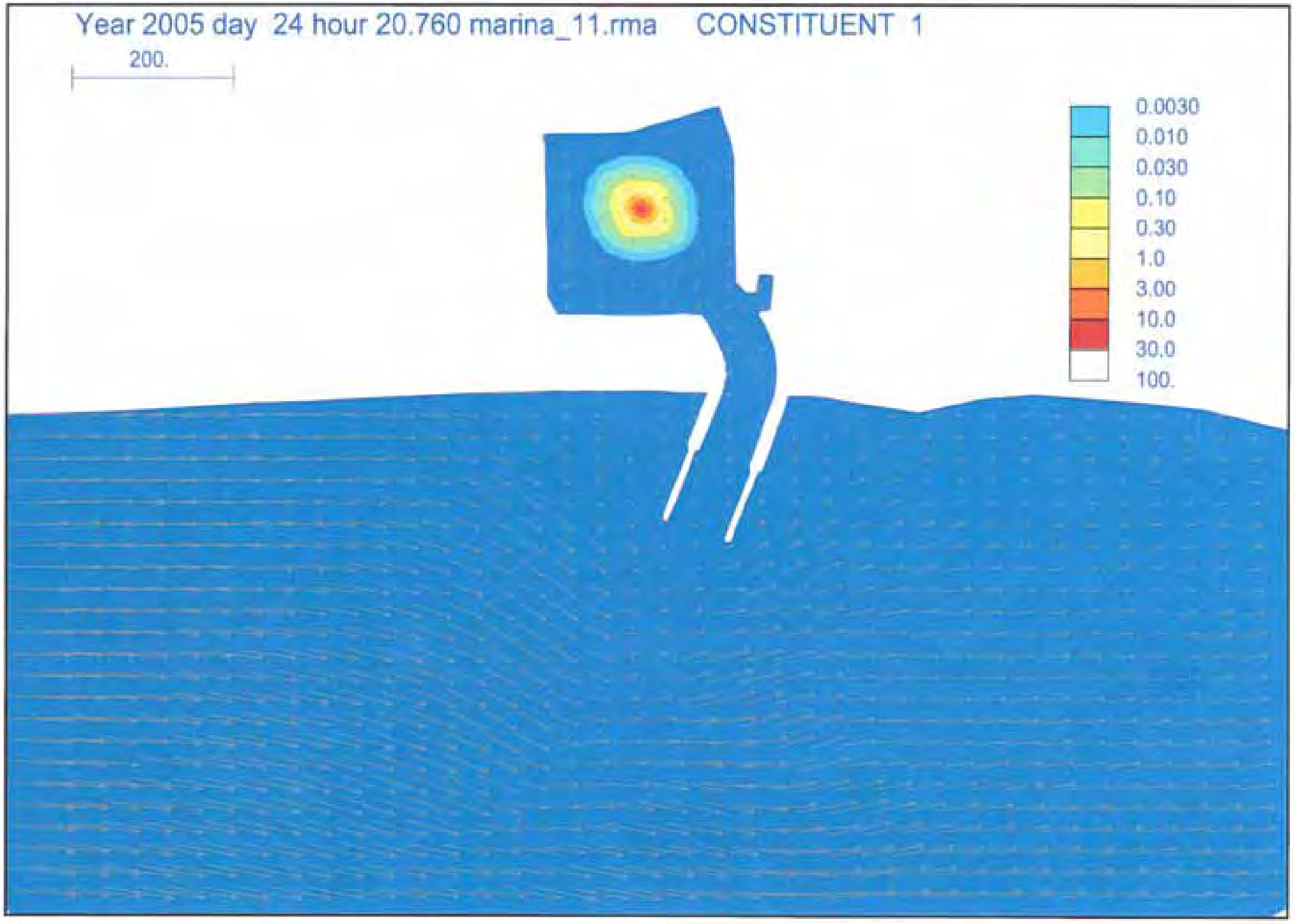


Figure 9.6 Marina water quality at start of pollution (rising tide)

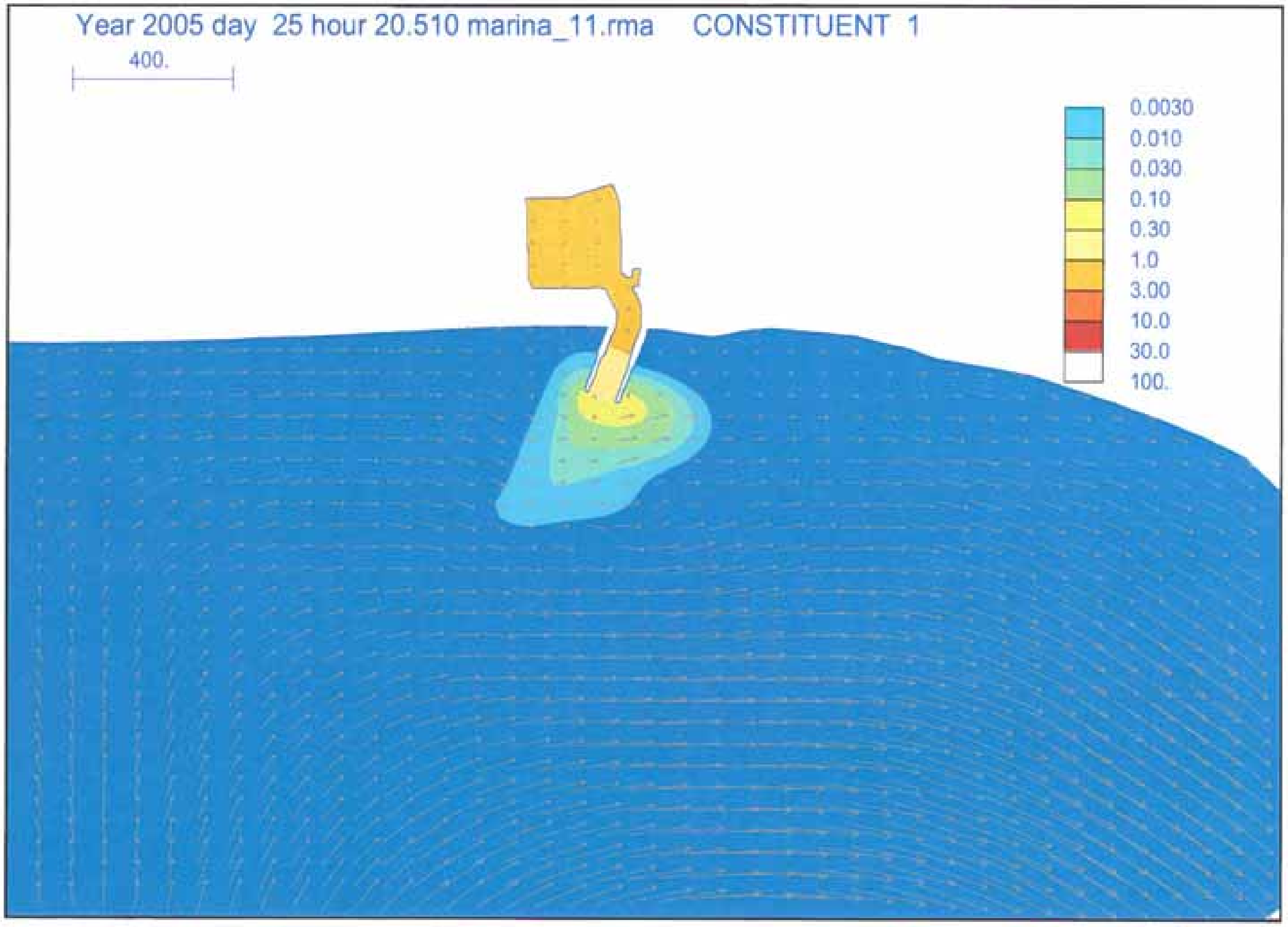


Figure 9.6 Marina water quality 24 hours later (rising tide)

Your reference:

Our reference: L&S/5984

DEPARTMENT OF LANDS & SURVEYS
P. O. Box N-592, Nassau
Tel. (242) 302-22328-9
(242) 302-22565
Commonwealth of The Bahamas

18 December 1998

The President
Country Sands Limited
P.O. Box N-8417
Nassau, Bahamas

Dear Sirs,

APPROVALS IN RESPECT OF SAND DREDGING AND UTILISATION OF PART OFF ARAWAK CAY

I am directed to refer to the letter to you dated 25 June 1998 and to advise that Government has granted approval regarding the above as follows:

1. Dredging

The dredging of sand in the Booby Rocks geographical area shown enclosed by the red line on attached copy plan (annex 1), subject to the following:

The dredging of sand in the Booby Rocks geographical area shown enclosed by the red line on the attached copy plan (annex 1) subject to following fees:

i.	Annual fee	$1,000.00
ii.	Royalty at $1.50 per cubic yard of sand sold	

2. Utilisation of part of Arawak Cay

Use of that part of Arawak Cay (1.5 acres) shown coloured red at annex 2 at annual fee of $5,227.20.

The terms of the non-exclusive licences are set out at annex 3 and 4. If you wish to accept this offer please forward the following:

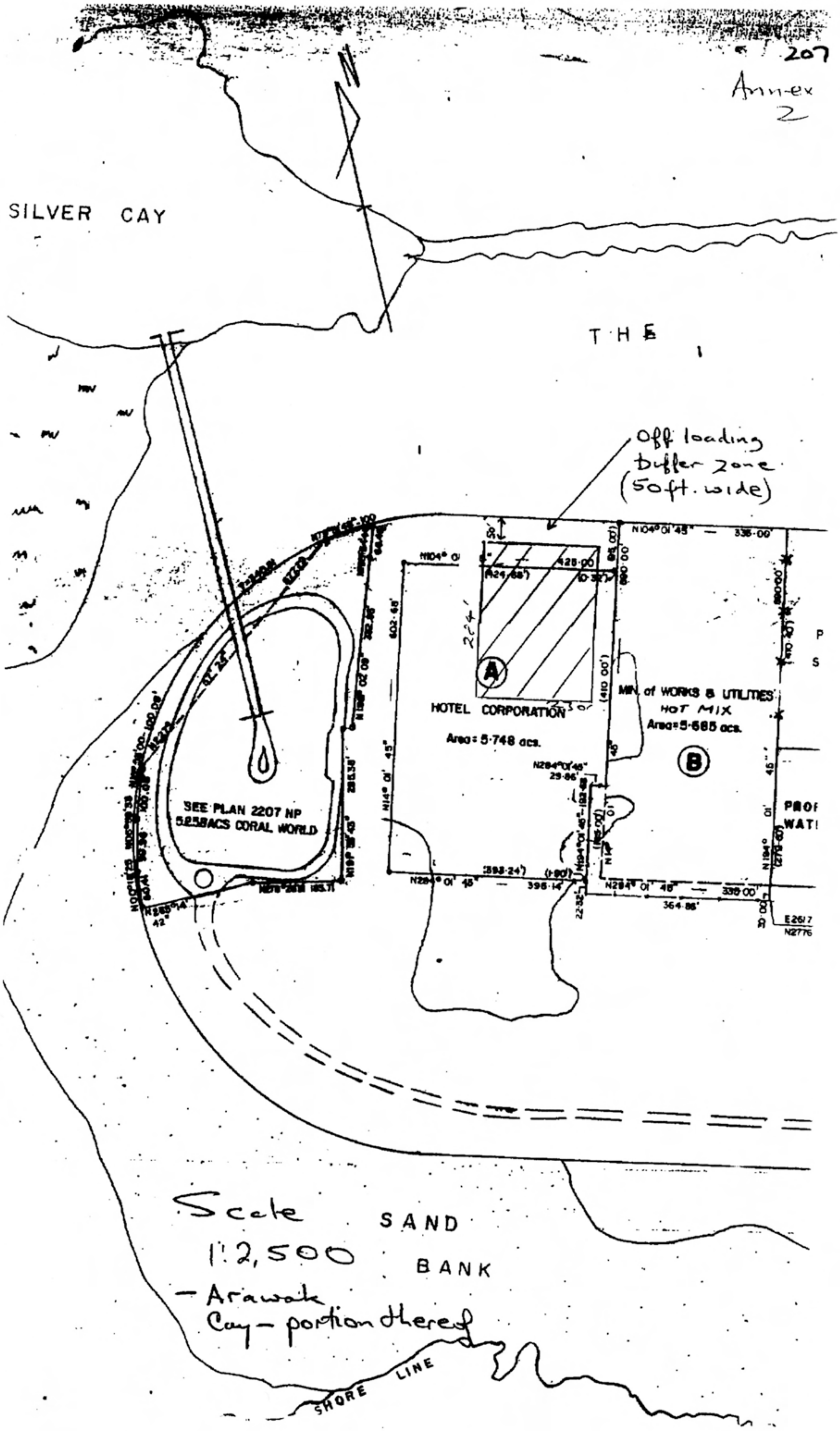
Dredging fee - 1 November 1998 to 31 October 1999	$1,000.00
Arawak Cay fee - 1 November 1998 to 31 October 1999	$5,227.20
Total	$6,227.00

If your written acceptance to this offer,, and fees set out above, are not received within three (3) months this offer will be deemed to have lapsed.

Yours faithfully,

R. S. Hardy
(for) DEPUTY DIRECTOR

RSH/msr


207
Annex 2
N
SILVER CAY
THE
Off loading buffer zone (50ft. wide)
50'
224'
A
HOTEL CORPORATION
Area= 5·748 acs.
MIN. of WORKS & UTILITIES
HOT MIX
Area= 5·665 acs.
B
SEE PLAN 2207 NP
5.258ACS CORAL WORLD
N104° 01' 45"
336·09'
N284° 01' 45"
330·00'
364·86'
398·14'
(393·24')
N114° 01' 45"
602·68'
(410·00')
Scale 1:2,500
SAND
BANK
- Arawak Cay - portion thereof
SHORE LINE

Annex 3

LICENCE TERMS

DREDGING

1. The Licensor hereby grants the Licensee subject to the reservations provisions conditions and restrictions hereinafter contained the right to dredge sand from the sea bed in the vicinity of Booby Rocks in the Commonwealth of The Bahamas as delineated on the attached map extract for a period of one year commencing on the 1 November 1998.

2. The fee for the said Licence shall be the sum of $1,000 and shall be paid to the Department of Lands and Surveys not later than thirty (30) days after commencement of this licence.

3. A royalty of $1.50 per cubic yard of sand sold is payable to the Department of Lands and Surveys in addition to the aforementioned sum.

4. The Licensee hereby covenants to undertake the following:

   (1) To mine sand and to sell it to the general public in New Providence only.

   (2) To distribute the sand to the public without discrimination.

   (3) To maintain the current rate of Ten Bahamian Dollars ($10.00) per vehicle loaded cubic yard of sand and not to increase this price without the approval of the Licensor.

   (4) To deposit sand at Arawak Cay off New Providence only and not in any other location.

   (5) To make available to the Port Department, free of costs, the Licensee's Barges and Crane for repairs, maintenance, improvements and beautification of Nassau Waterways and surrounding areas.

5. Removal of sand from any beach within the Commonwealth of The Bahamas is prohibited.

6. The operation shall be conducted in a manner satisfactory to the appropriate Governmental Authorities and in accordance with any existing laws, orders or rules as prescribed by such authorities and to satisfaction of the Licensor and in the conduct of these operations the Licensee shall ensure that no obstruction to navigation is occasioned.

7. The Licensor, his servants or agent may inspect the said dredging operation at all reasonable times and for this purpose shall have the right to enter, pass and repass over any land the property of or under the control of, the Licensee by virtue of this Licence.

8. This Licensee shall not constitute a bar to prevent the Licensor or any person rightfully claiming under or in trust for the Crown from entering on the foreshore or other property of the Crown.

9. This Licence is not transferable at any time and is solely for the use of the Licensee and does not confer upon the Licensee any rights usually enjoyed by a tenant under a lease.

10. The Licensee covenants that is shall cause to be prepared accounting records in accordance with proper accounting standards and shall forward to the Licensor, a Balance Sheet and Income Statement on an annual basis within three (3) months of their year end, and to forward monthly statements of their sales receipts within two (2) weeks of each month end.

11. This Licence does not confer on the Holder the right to any silver, gold or other metals minerals ores, gems or precious stones, natural gas coal, mineral oil or other such substance on or below the surface of the said Bed the Sea and shall not be used for any purpose whatsoever other than that stated in the Licence. Any such other use shall render this Licence liable to forfeiture.

12. This Licence is in respect of dredging operations by a single dredge only and not more than one dredge shall be used by the holders of this Licence for the said dredging operations without first obtaining the permission in writing of the Licensor. And further nothing contained in this Licence shall be deemed to be binding upon the Crown to grant permission for the use of additional dredges by the holder of this Licence.

13. The Licensee undertakes to produce and maintain steady and adequate supply of sand for public use and in the event that the Licensee permits shortages for a period of 30 days or more, the Lessor shall exercise the right, without liability to the Lessee to make arrangements with other suppliers.

14. The Licensee shall indemnify the Lessor in respect of any damage caused to beaches or marine ecosystems by the dredging operation or any claims made by other parties for damage or loss suffered as a result of the works carried out by the Licensee pursuant to this Licence.

15. This Agreement shall terminate on any of the following occurrences:

    (i) A decision by the Government of The Bahamas or by the Licensor that the premises to which this Licence applies are required for another purpose. Such a decision shall be final and shall not be open to arbitration.

    (ii) Withdrawal by the Licensee from the demise for a period in excess of 13 days.

    (iii) Default of the Licensee of any of the conditions under the Licence.

    (iv) The filing of a petition for the winding up of the Licensee or the seizure of any assets of the Licensee by its creditiors.

    (v) The conviction of any officer of the Licensor for the offence if trafficking in dangerous drugs.

16. This Licence may be renewed by the Licensor upon such terms and subject to such conditions as the Licensor may determine.

EIA Supplement 1

ADELAIDE BEACH NOURISHMENT- Addendum I

Supplemental information (Exhibit J, Appendix II)was prepared by Smith Warner International. It describes the proposed Adelaide beach nourishment and monitoring program

CORAL RELOCATION AND CHANNEL MITIGATION

One small area of the proposed marina access channel contains a higher concentration of coral resources than the remainder of the channel. Suggestions have been made that these resources can be moved out of the channel's path and relocated into another location. The developers have agreed that this activity can be undertaken. The proposal is to relocate the coral resources that can be successfully moved into a nearby area that will be set up as a snorkeling park off of the project shoreline. The relocated corals will be used to seed artificial reefs off of the project shoreline and an educational component will be developed that describes the corals and other local benthic resources for distribution to residents and patrons of the development.

The corals will be catalogued and mapped as they are relocated. Successful relocation will depend on size with small to mid-size (less than 0.5 m diameter) colonies likely to transplant more easily. Artificial reef materials may be purchased from commercial manufacturers (such as ReefBall Inc.) or constructed in-situ. Removal will be carried out by hand and best available methodologies and appropriate cementing products will be used to attach the specimens to the new structures.

Figure 6: Coral resources that will be relocated to snorkeling reef area.

Figure 7: Reef Balls: hollow concrete domes are produced to eventually be towed and placed on the ocean floor to enhance coral and fish habitat

A monitoring program will be designed to track the survival and growth rates of the relocated colonies. This work will include;

- **GPS location of installed reefs**
- **Mapping and growth measurements of the relocated corals**
- **Bi-annual (winter and summer) observations of bleaching or signs of stress (algal overgrowth, excess mucus production).**
- **Colonization by other species and epifauna.**
- **Photographic documentation.**

Details of the monitoring program will be determined once the snorkeling reef plan is further detailed. Usage of the snorkeling resource by guests and residents will also be followed. The monitoring plan, when completed, will be included in the Environmental Management Plan (EMP) that is being developed for the project.

EIA Supplement 2

Question #6.
Please clarify whether the artificial reef structure referred to on page 3 of Appendix II is in fact a man-made breakwater constructed to prevent closure of the opening for water flow into the creek system adjacent to the development.

The artificial reef structure referred to on page 3 of Appendix II is a man-made structure that is reported to have been constructed in the late 1960's. The stated rationale (as indicated by Mr. Pericles Mailis) for its construction was to provide a sheltered berthing zone for fishing vessels, particularly during south-easterly storms, and not to regulate water flow into the creek system adjacent to the Albany development. This structure is some 1 ½ miles west of the Adelaide Creek mouth and, at this distance, in no way affects the flow of water into the creek system. The artificial reef is built on top of a natural bar, 'Adelaide Bar', which runs along the coast in the area.

Question #11.
Appendix II, page 7, also states that the proposed location of the sediment sink is given in Appendix I, is this in fact the drawing at the end of Appendix II? Please confirm that this is also the drawing reflecting the cross sections of the channel or details of the inlet jetties as indicated on the same page.

Appendix II of the EIA includes a drawing at the end labeled Appendix I. This drawing shows the proposed location of the sediment sink and also includes plans and cross-sections of the access channel and jetties. We apologize for the ambiguity in this regard.

Questions #13 and 15
#13- On page 87 of the EIA states that no erosional problems are anticipated. Why then in BEST's meeting of January 25th, 2006 with the developer's technical team including engineers, was it stated that maintenance nourishment of the beach would need to be done every 3-4 years?
#15- At this time BEST cannot recommend approval for the marina component of this project. The Commission disagrees with the statement on page 22 that the site is suitable for marina development. Page 43 of Appendix II notes that the construction of the proposed inlet structures will cause a relatively large impact on the shoreline. If the site were indeed suitable for marina development there would be no need for the extensive dredging (approximately one million cubic yards of sand and rock), construction of stabilizing structures for the channel or continual re-nourishment of the beach. The negative environmental impacts of the present design will be extensive and sustained over many years with the need to continually seek sand to re-nourish the beach as the hard structures constructed to stabilize the marina access channel will disrupt the sediment flow cycle of the beach. It is recommended that the developers re-examine their design with the aim of finding one that would have fewer negative environmental impacts.

The marina is a central and fundamental component of the overall project. While it is not located in a natural harbour, it is as suitable as any other marina site located on the island of New Providence, in the sense that it requires inland dredging to create the basin and entrance channel, construction of entrance channels and also requires consideration of its impacts on adjacent shorelines. Detailed analysis of coastal dynamics has been undertaken to ensure both construction and future management can proceed with the least impact to the environmental and greatest benefit to the residents and visitors to New Providence.

The existing beaches between Stuart Cove and Adelaide Creek channel have eroded historically, and continue to experience erosion today. The 1942 map (Figures 3A and 3B, Appendix VII) shows the original shoreline location in relation to the upland properties. Note the substantial difference between the historical shoreline, and that existing today. In the next decade, the property owners adjoining this shoreline will likely be required to nourish this stretch of beach to maintain the shoreline in its current location. This nourishment will result in the creation of a man-made beach system.

The Albany Project team is proposing to include this nourishment project as part of the overall Albany Development. This nourishment will create a stable shoreline for Adelaide and other shoreline residents (including Albany residents), that will be maintained by a long-

term maintenance program to ensure long-term stability for the residents in this area, as well as visitors. In addition, adding sand to this system will enhance the buffer between shoreline residents and the destructive forces of future hurricanes and other storm events. On this issue, it should be noted that recent investigations carried out within the Caribbean and by NOAA, point to our entry into a multi-decadal increase in the intensity and frequency of hurricane events.

The following conclusions are provided to confirm the results of the detailed modeling, analyses and field observations conducted by the Albany Project Team:

1. There is sand movement in this beach system between Adelaide Creek west to Stuart Cove and beyond. Over time, this beach has been slowly eroding, with or without the presence of the proposed Albany Project entrance channel.

2. The Albany Project includes the proposal to create an entrance channel, and to divide the beach system into two separate cells. The two beach cells (or beach systems) are proposed as follows- the firest is the extension from Adelaide Creek to the east edge of the Albany entrance channel, and the second is the west edge of the Albany entrance channel west to Stuart Cove's channel.

3. Particularly during storm events, sand will naturally migrate into the Albany entrance channel (requiring periodic dredging). While the Albany Project will create a man-made system that must be managed, it effectively will result in the reduction or controlling of the existing longer-term erosion that has been ongoing.

4. Numerical modeling and field investigations were conducted, and these results indicate nourishing the beach (in both cells), which is proposed in tandem with the installation of stabilizing structures such as groins, will create a managed stable beach environment. That beach environment will only be susceptible primarily to substantial erosion during major storm events. As a result fo the 'pre-nourishment', nourishment events will be much less frequent than originally proposed (previously thought to be 3 to 4 years).

Therefore, in order to ensure long-term shoreline/beach stability, a mitigation-type bond in the order of $1million is proposed. This bond will be established in order to fund future maitenance events, as required by natural erosion, major storm events, and the combination of the two. These maintenance events will return the beach to its existing, post-nourishment condition. Ultimately, this funding source will ensure the beaches in this area, between Albany and Adelaide Creek, will be maintained for the long-term enjoyment of residents.

EIA Supplement 3

Pertaining to Questions #13 and 15 in Supplement 2
#13- On page 87 of the EIA states that no erosional problems are anticipated. Why then in BEST's meeting of January 25th, 2006 with the developer's technical team including engineers, was it stated that maintenance nourishment of the beach would need to be done every 3-4 years?
#15- At this time BEST cannot recommend approval for the marina component of this project. The Commission disagrees with the statement on page 22 that the site is suitable for marina development. Page 43 of Appendix II notes that the construction of the proposed inlet structures will cause a relatively large impact on the shoreline. If the site were indeed suitable for marina development there would be no need for the extensive dredging (approximately one million cubic yards of sand and rock), construction of stabilizing structures for the channel or continual re-nourishment of the beach. The negative environmental impacts of the present design will be extensive and sustained over many years with the need to continually seek sand to re-nourish the beach as the hard structures constructed to stabilize the marina access channel will disrupt the sediment flow cycle of the beach. It is recommended that the developers re-examine their design with the aim of finding one that would have fewer negative environmental impacts

- **There is historical evidence of a creek entrance at the location planned for the Albany marina entrance. This dates back to the 1920's and sets a strong precedent for a 2-cell beach system at this very spot.**
- **Historical mapping of the shoreline (HWL) indicates that over the past 60 years, the shoreline has been eroding at a rate of between 0.5 and 1.0 ft. per year.**
- **This erosion has been worst in the vicinity of the Adelaide Creek entrance.**
- **Overview aerial photography shows a "pathway" of alongshore sand movement in a band along the shoreline. At the western end of the cell, some of this sand makes its way around into Clifton Bay, while the remainder (perhaps the majority) goes over the shelf edge and is lost forever to the coastal system.**
- **The grouping of the Albany entrance jetties, the proposed Adelaide beach nourishment and the proposed shore retention structures west of the Adelaide Creek entrance, combine to make a managed, 2-cell beach system. This is intended to halt the historical and ongoing erosion along this stretch of shoreline and to provide a widened beach for the residents of Adelaide.**
- **Initially, the beach will be widened through a sand nourishment initiative.**
- **It should also be noted that the beach in front of the Albany project will be nourished, therefore providing both a wider beach to this facility and a source of sand to the more westerly properties.**
- **Subsequently, any sand that accumulates against the jetties (for the majority of the time, this will be against the eastern jetty) will be bypassed to the other (western) side of the entrance.**
- **The bypassing program is therefore intended to ensure the continual supply and movement of sand to the beach zones west of the Albany project. During times of westerly waves, the bypassing program may require the movement of sand from the west side of the jetties to the east.**

- **Based on computer simulations of shoreline change predictions and from field observations of the existing breakwater offshore the Mailis property, it is estimated that over a 5 year period, approximately 10,000 to 20,000 cubic yards of sand will need to be bypassed. This could also be carried out on an annual basis if deemed to be more effective (2,000 to 4,000 cubic yards in a year), or, for longer, less frequent periods if found to be more appropriate.**
- **The actual details of the bypassing program will be advised by beach profile monitoring results. These results, in an interpreted form, will be sent to BEST for their files and information. Decisions as to the actual required frequency of bypassing, and direction of sand placement, etc., will be advised by the monitoring. This will ensure that beach changes that are triggered by storm events will be accounted for in the management of this exercise. Further, this will ensure that a completely transparent process is adhered to and that BEST will be kept fully up to date with the bypassing schedules. Beach profile monitoring will begin shortly.**
- **Based on present commercial rates of dredging, and on the use of hired or own equipment, the bond which is to be posted by the developers should provide the government with the surety that dredging can be funded for the next 20 to 40 years.**

EIA Supplement 4

Question #1

Models should be run and submitted for BEST's review for the proposed channel without the jetties and the sediment sink to show the impact to the surrounding beaches and the littoral drift in the area.

Sediment transport studies, which have been submitted as a component of the engineering analysis submitted to BEST along with the original EIA, indicate that sand traverses the coastline of southwestern New Providence Island in a westerly fashion (the average sediment transport was modeled to be 1,550 m^3/year by Smith Warner International, Inc.). Without construction of the jetties, it is predicted that sediment will fill in the entrance channel, resulting from both gradual longshore movement and rapid deposition associated with extreme storm events. This would result in the need for increased maintenance dredging of the entrance channel.

The jetties and sediment sink are intended to function as an integral component of the new beach system that is being created for the southwestern coastline of the island. The dredging of an entrance corridor for the marina effectively serves to create two independent littoral cells to the east and west of the entrance corridor, respectively. The jetties are intended to stabilize each cell as well as prevent nearshore sediment flow from accumulating in the channel corridor. The sediment sink will serve to trap sand that is predicted to accumulate along the eastern jetty; this sand will be redistributed to the western cell as required through maintenance dredge and fill operations (implemented via funding from the developers).

<u>*Question #2*</u>
The assumptions made for the marina water quality analysis, analytical calculations and explanatory text, and flushing curves (showing the residual concentration versus time for high, average and spring tide for a case with and without wind) should be presented (site specific date e.g. tide, current, wind should be used).

A water quality model (RMA-11) was utilized to examine flushing characteristics within the marina basin. The model simulated a 19-day period, with introduction of an arbitrary pollutant of 50 mg/L for 4 hours. The pollutant was allowed to disperse, with the assumption of a constant wind speed of 2 m/s with a north-westerly direction applied. The study showed that the pollutant concentration within the marina basin after 24 hours is between 1 and 3 mg/L. This implies that more than 90% of the initial pollutant concentration has been flushed out of the basin, achieving compliance with U.S. Environmental Protection Agency (EPA) recommendations for marina flushing.

Ongoing water quality monitoring is proposed within the marina basin to determine whether pollutant concentrations within the basin are acceptable in nature. If water quality monitoring reveals excessive pollutant concentrations or stagnant water, mechanical flushing options for increasing circulation within the basin will be explored.

<u>*Question #3*</u>
The following figures should be enlarged and resubmitted 7.2, 7.3, 8.2, 8.3, 8.4, 9.3, 9.4 and 9.6.

These figures have been enlarged and are included in this resubmittal package as Exhibit G.

<u>*Question #4*</u>
A cross section diagram should be provided showing the method of stabilization of the marina walls.

The natural rock of the basin walls will be utilized to the greatest extent possible, as is common throughout The Bahamas. A typical cross section is attached as Exhibit A.

<u>*Question #7*</u>
What quantity of coral, sea grass beds, etc. is going to be impacted by the proposed channel?

The total area of impact (equivalent to the area of the proposed entrance channel) is 16.99 acres. It should be noted that high impacts to corals are only proposed over 0.39 acres, and relocation is proposed for the majority of these corals prior to dredging activities.

<u>*Question #8*</u>
What is the littoral drift, direction of the drift and the width of the beach in the summer and the winter along the development area and proposed affected area?

Littoral drift has been modeled by Smith Warner International at between 500-1,500 m^3/year and is predominantly from east to west. The presence of the nearshore sand bars indicate

seasonal variations in beach widths as sand is brought on and offshore at different times of the year resulting in varying beach widths. Evaluation of the winter and summer beach width characteristics will be carried out through a process of beach profile monitoring along this stretch of shoreline.

Question #9
It has been noted that the shoreline was historically open to the ocean via a creek entrance channel. Why was the location of this creek channel not chosen as a marina channel option? If it was not considered, it is recommended that this design option with modeling be explored and presented.

The Albany developers have not been able to procure a geographically referenced map that is accurate enough to pinpoint the exact historic entrance of the creek mouth. From a review of the maps and charts available from the time period that the creek was originally in existence (pre-1900), the developers are confident that the proposed entrance channel exists within close proximity to the historic creek mouth. Neighboring residents, the Maillis family, note that at one time the creek mouth location was probably very close to the site of the original Maillis canal. This channel was re-opened during Hurricane Betsy in 1964, exposing thousands of consumed conch shells which must have been disposed of in a marine location. Creek mouths like this typically meander and change over time, and it is likely that the creek mouth was very near or on top of the proposed marina entrance channel at times. Indeed, Mr. Pericles Maillis also observes that the channel subsequently migrated to the west and, such is the ephemeral nature of coastal tidal creeks, that the historical positioning alone does not provide sufficient justification for channel location. The marina channel has been designed to incorporate a portion of the existing upland basin, while at the same time avoiding areas of significant marine resources offshore. It is also located at an appropriate distance from preserved cultural features and in such a way as to accommodate and support project neighbors without whom aspects of the planned marine improvements could not occur.

Question #10
Indicate on a map where the proposed reef balls will be located in conjunction to the project and the existing corals. How will these reef balls be anchored to the seabed?

The project team is exploring the use of both concrete reef balls and limestone boulders to mitigate for impacts to corals. Both the reef balls and boulders are typically not anchored to the seafloor—instead the substantial weight of these objects keeps them firmly situated on the seafloor (even during extreme storm events).

The reef balls/boulders are proposed to be placed adjacent to the proposed access channel in similar depths to the existing corals. A figure is enclosed, as Exhibit C, showing the location being considered by the team.

Question #11
What is the estimated cost for beach renourishment for the affected areas for 30 years?

Maintenance nourishment is predicted approximately every 4-6 years or as required after extreme storm events. Although the extent of renourishment will to a large extent depend on the frequency of occurrence of storms, we anticipate that no more than 10,000 cubic yards of material will be required to be placed on the shoreline at projected 4-6 year intervals. We have priced this nourishment by assuming a unit cost of $30 per cubic yard, an inflation rate of 2% and an interest rate of 3%. The table below shows a summary of the costs for each nourishment period as well as the present value of the overall cost.

Years after construction	*Renourishment Cost(2% Inflation)*	*Present Value of Cost (3% Interest)*
5	$ 331,224	$ 285,717
10	$ 365,698	$ 272,114
15	$ 403,761	$ 259,159
20	$ 445,784	$ 246,820
25	$ 492,182	$ 235,069
30	$ 543,408	$ 223,877
	Total renourishment cost	$ 1,522,755

<u>*Question #14*</u>
How will the cut for the adjacent property affect the flushing rate of the marina?

Although the cut for the adjacent property may be expected to marginally decrease the flushing rate for the marina basin, water quality at the neighboring basin will be substantially increased due to the introduction of tidal flushing to that basin. In addition, because the flushing rate for the marina exceeds the USEPA requirements, there is some "buffer" which will absorb the effects of the adjacent property being connected to the main marina.

<u>*Question #15*</u>
A cross section and detail on the curtain wall should be provided.

Please referenced attached Exhibit A.

<u>*Question #16*</u>
*What percentage of corals survives a relocation exercise***?**

Coral survival rates associated with relocation are relatively high; a recent large-scale coral relocation project (involving 14 tons of coral) in the Pacific conducted by the U.S. National Oceanic and Atmospheric Administration (NOAA) and U.S. Army Corps of Engineers resulted in 99% of corals surviving relocation. It should be noted that the project team intends to utilize professional divers experienced in coral relocation techniques. The relocated corals will be monitored during and subsequent to coral relocation for health and vitality.

<u>Question #17</u>
What impacts will the proposed channel have on the local boating community?

The Albany developers are committed to ensuring that the highest standards of navigational safety are followed by both marina operators and the boaters that will patronize the marina. Navigational markers will be utilized to demarcate the boundaries of the entrance corridor. Vessels operating within the corridor will be required to proceed under slow speed (i.e. minimal wake) until reaching deepwater.

<u>Question #18</u>
Where will the rock material be sourced?

Depending on coastal design criteria, rock material for breakwaters can be sourced out of Freeport, Dominican Republic, or Nova Scotia (for heavier rock, sources outside of The Bahamas must typically be utilized).

If you have any questions regarding our responses as outlined above, I would be happy to speak with you at your earliest convenience. The Albany development team looks forward to continued collaboration with the Government of The Bahamas regarding this project.

EIA Supplement 5

<u>Marina Entrance</u>
This will obviously have a significant impact on sediment transport and shoreline response. The proposed jetties will significantly influence beach accretion and erosion, such that major beach enhancement and nourishment mitigation is proposed. It would be helpful to have more analysis pf the impacts of not installing jetties, particularly with regard to the maintenance dredging that would be required. More specific questions are included below in the clarifications section.

We do not consider it feasible to have a "no jetty" entrance layout. The day-to-day sand movement along the beach would make this completely impractical from an operational point of view.

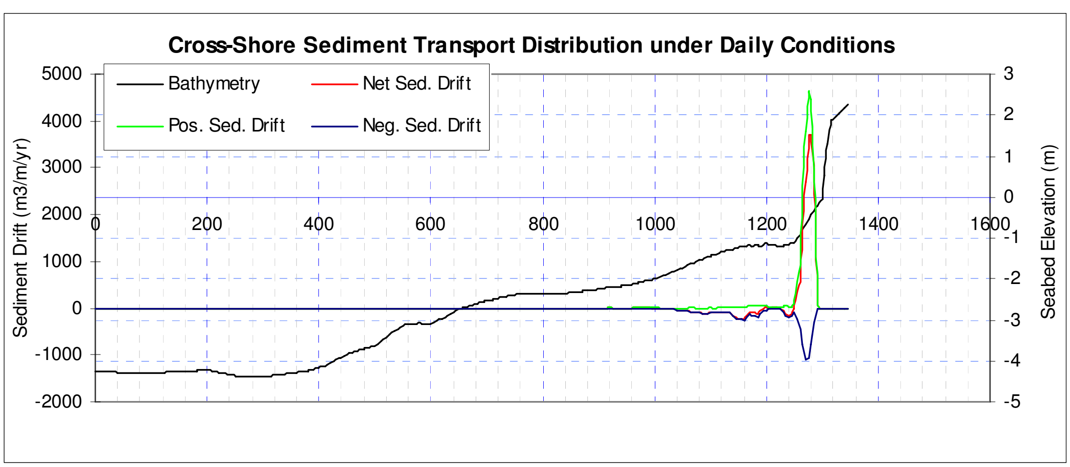
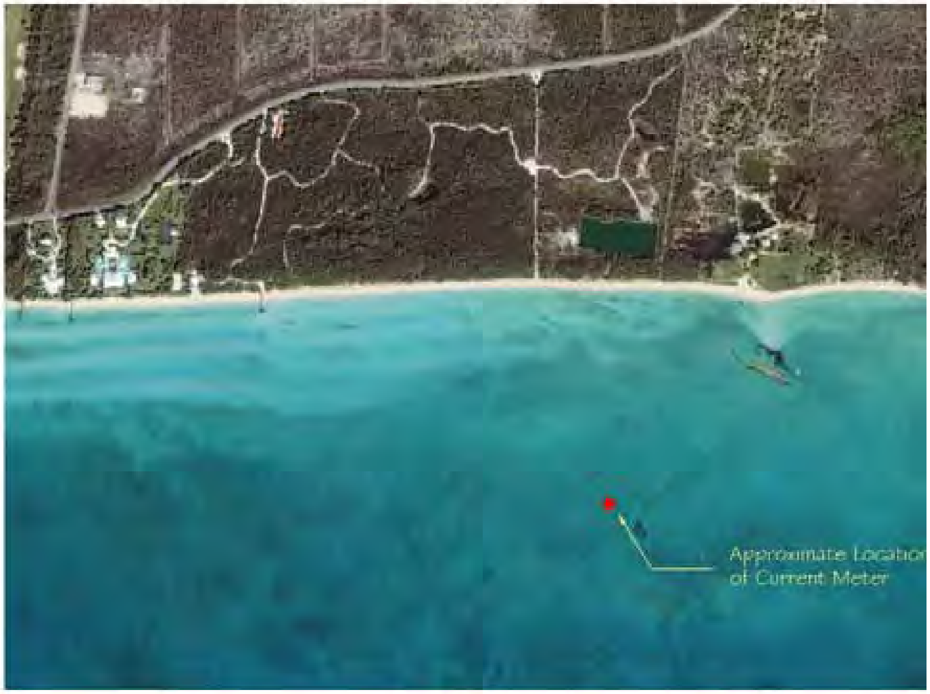


Figure 10.13 (above) of Appendix II, indicates the extent of the zone of sand movement for the Albany shoreline. The figure shows that most of the movement occurs out to a distance of 175m from the shoreline. The proposed length of the jetties is within 70m from the shoreline, which was deliberately chosen so that only a portion of the sand movement is interrupted. While further investigation into shortening of these structures is possible, it may be impractical to do so.

Tides, Current Patterns and Marina Water Quality
Please provide more detail on the current measurements presented in Appendix II. Where was the current meter located? At what depths were currents measured? If more than one depth was measured, are depths averaged currents shown in the figures?

Predominant winds are from the east and southeast. Why was a northwesterly wind used in the simulation? Was the simulation for neap, spring or average tides? What was the tidal phase at the start of the simulation? How do the results change with the tidal phase?

- **The current meter used to measure the currents was a Sensor Data (SD 6000). This instrument has a rotating vane which is factory calibrated to record water velocities. Current speed and direction data is stored in memory and downloaded upon retrieval of the instrument.**
- **The current meter location is indicated in the following figure. Currents were measured at a water depth of 3m. Measurements were only collected at this location. It should also be noted that drogue tracking was carried out to give indications of water mass movements.**



- **In the carrying out of the hydrodynamic computer modeling, winds approaching from two directions were applied (on the model grid); 112 degrees and 157 degrees from north. These correspond approximately to winds coming form the ESE and SE directions, respectively. It must be noted that the reference in the report to the application of a North Westerly wind, refers to the direction that the wind was moving to and not the regular convention of direction of approach.**
- **The simulations were carried out for a 19-day period, which include both neap and spring tide conditions.**
- **Note that the model was run in a dynamic simulation mode such that 38 tidal cycles (semi-diurnal cycles) were simulated over the 19-day period. The tide data represented was measured concurrently with the current measurements using a dedicated tide gauge.**

Sediment Transport Analysis
How accurate do you consider the models to be? What effect would changing the jetty lengths have on other modeling conducted including the wave and current patterns and wave height inside the marina basin?

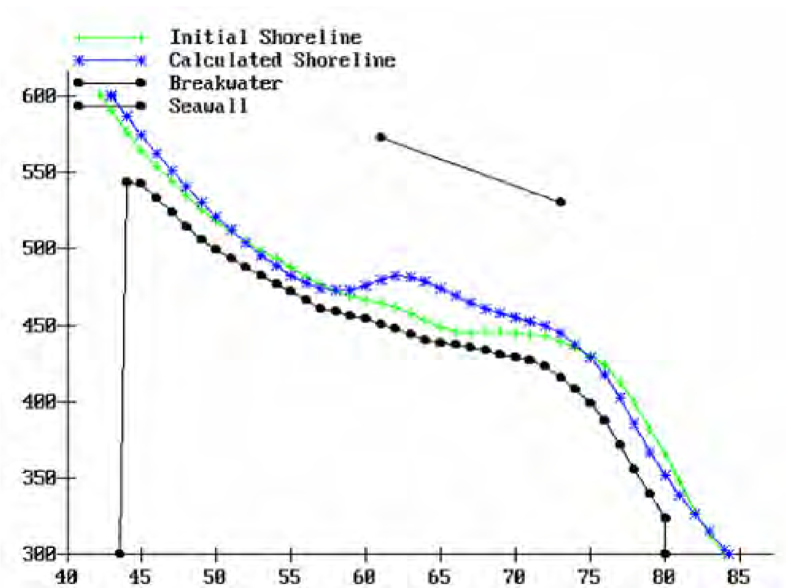
In general, sediment transport models are not expected to be precise, due to the unknowns and differences in the actual manner in which sand is transported in the nearshore zone and the mathematical formulations that are used to represent this phenomenon. In addition, seasonal wave climate variations and the occurrence of storms also serve to make the sand transport phenomenon even more complex. However, there are some ways in which Coastal Engineers may work around these uncertainties. These include:

a) Running several different sediment transport models to try to arrive at a "most likely" scenario.
b) Running the same model with slightly varying input conditions, also to arrive at a "most likely" scenario through sensitivity analysis.
c) Use of a physical hydraulic model as a visual instructive tool, accounting for the fact that any such models of Caribbean sand beaches must have inherent scale effects.
d) Use of field observations to "verify" the model results.

For the Albany project, approaches a, b and d were taken. In summary, a number of varying input conditions were modeled leading to a sensitivity analysis. Also, the build up of sand behind the existing near shore breakwater was assessed in the context of the model predictions

Specifically, through discussions held with Mr. Pericles Maillis, the owner of the land in question (adjacent to the eastern property boundary of the Albany property) and the contractor for the breakwater, a semi qualitative assessment of the build up behind that breakwater within the first one to two years of its construction, was derived. This was compared with the model predictions and used to assist the calibration exercise.

At a more general level, the GENESIS model has been used by our company with success at other locations around the Caribbean. These include Barbados, St. Kitts and St. Lucia, among others. An example of its use in St. Kitts is shown in the figure below. This figure shows the model-predicted shoreline, in response to the construction of a breakwater, and a photograph shows the achieved shoreline response after a year following construction.



<u>*Beach Enhancement and Re-nourishment Program*</u>
Please clarify the plan for advance beach nourishment. The numbers in Appendix II, Sections 10.2, 11.1 and 11.2 are not consistent.

A total of 60,000 cubic yards will be placed on the shoreline adjacent to the marina entrance channel for the initial nourishment. 20,000 cubic yards of this amount will be placed on the west of the entrance channel, along the Albany beach front. The remaining 40,000 cubic yards will be placed on the eastern side of the channel out to a distance of 6600 ft away.

Will the proposed beach enhancement / re-nourishment extend all the way to the Adelaide Creek channel? A map showing all the proposed beach enhancement and re-nourishment areas and extent would be helpful.

The beach nourishment plan is shown in the attached figure. As shown, the initial nourishment will not be placed out to the Adelaide Creek channel.

Beach re-nourishment east of the entrance channel would extend off Albany's property (approximately 6600 feet beyond the east property boundary as recommended in Smith Warner Coastal EIA Addendum pg. 6). What provisions would be made with private property owners along this area for beach restoration activities?

Section 11.2.1 of Appendix II of the EIA makes the following recommendations: Additionally, it is advised to monitor the shoreline for several years after construction. A beach monitoring plan should be prepared and undertaken prior to, during and after construction. This monitoring programme would consist of carrying out a beach profile survey at specific locations. Prior to the construction phase, several beach profiles should be measured on the west and east sides of the inlet jetties at a frequency of once every three months. During construction of the entrance channel, beach profiles should be taken at the same locations once per month. Finally, after construction, the surveying frequency would be reduced to once every three months during the first two years, and once every six months for the following three years.

Please confirm the frequency and extent of monitoring of beach profiles to be conducted.

At a minimum, profile measurements will be carried out twice per year: once in June and then in November. These periods represent the start and end of the hurricane season, or the end and the start of the swell season, respectively. With this approach, the seasonal variations in sand movement from tropical storms and winter swells should become evident. The beach profiling will be done at 300-ft intervals over the extent of the proposed nourished shoreline.

What all is included in the beach re-nourishment cost estimate of $30/cubic (EIA Response Supplement #4)? What is the basis for the estimated maximum re-nourishment amount of 10,000 cubic yards every 5 years for 30 years?

The unit cost of $30/cubic yard represents an estimated cost to supply, place and grade beach sand along the Adelaide shoreline. Appendix II of the EIA states that the potential sediment transport rate (maximum expected) is 1550 cubic meters (2015 cubic yards) per year. In determining the quantity of sand required for re-nourishment, we conservatively assumed that this quantity of sand would be lost annually from the beach, hence a total of 10,075 cubic yards over a five year period.

The sand bypassing operation will be dictated by the beach monitoring program. The sand will be dredged with a suction dredger from the east side of the channel. The sand will be pumped across the marina entrance channel into sedimentation ponds on the west side of the channel. The supernatant will be allowed to runoff leaving the solids to dry out. The sand will then be placed and graded on the beach at the areas determined from the monitoring program.

Identify the source (location and amount) of offshore beach sand supply (EIA Supplemental Response #1 - Smith Warner Coastal EIA Addendum pg.6).

Sand required for mitigation will be supplied by Country Sand Ltd. The source of the material will be from a Government permitted dredging operation on the North-East end of Rose Island. The present quantity of sand available is in excess of 1.5 million cubic yards.

Please provide further description (and diagram) of how the annual sand bypassing program (from east jetty to west side as referenced in EIA Responses Supplement #3) will be carried out.

Please see the attached Preliminary Beach Enhancement Plan (Exhibit F).

Marina Entrance Channel
Does the response provided in EIA Supplement #4 infer an expected 99% coral relocation survival rate? Will a comprehensive Coral Relocation Plan be provided as part of the project EMP? Will a dredging surety bond be provided as mentioned in the EIA Response Supplement #3 If so, what is the amount and conditions of this financial assurance? Will a comprehensive Dredging Plan be provided as part of the project EMP? Will a surety bond or some other financial assurance for future dredging operations be provided?

In the example cited, a 99% survival rate was observed but there is no guarantee that this can be achieved at the project site. As coral relocation (to be carried out by qualified biologists) will be subject to field based judgment in the appropriateness of transplanting a given colony, a pre-defined plan will not be provided. Reporting and on-going monitoring will document the success of both the initial work and longer term achievements. Likewise a separate dredging plan will not be submitted, details will be found in marine construction plans following project approvals. No surety bonds are considered necessary at this time and it should be noted that project developers have already pledged a significant sum to The Government for mitigation purposes.

EIA Supplement 6

Beach Renourishment
Sediment transport analysis of the non-jetty option for marina cut through beach.

Jetty Design Option.

The jetties as proposed for the marina inlet extend approximately 40 m and 70 m (132 and 230 ft) offshore from the marina entrance (west and east jetty respectively). For marina sheltering purposes, the jetties are proposed to have a crest height of +2.50 m (8.2 ft) above MSL. The eastern jetty extends further offshore than the western jetty so as to reduce the wave penetration into the entrance from the predominant south-easterly waves.

The sediment transport modeling that has been carried out (using the LITPACK and GENESIS models) give insight into both the jetty and no-jetty conditions. Essentially, for either condition, the impact on the sand transport regime is the same. In both cases, the presence of a jetty, or of a dredged channel, provides a total barrier to the alongshore movement of sand. In both cases therefore, the sand must be pumped from one side of the entrance to the other. The only difference therefore relates to the frequency of dredging.

It has been proposed by the development team that three separate levels of funding be established for this bypassing program to ensure that the Government has adequate comfort that the tasks at hand may be completed, without question, indefinitely into the future. As such, the developer will initially establish a Community Foundation Fund to facilitate the pre-nourishment of the beach in the surrounding area, which has been recommended. Secondly, all homeowners at Albany will be legally bound to ensure that they pay for the required costs related to dredging the Marina channel entrance and the by-passing program related to maintaining the beach shoreline into perpetuity. This will be accomplished through a monthly assessment in the form of a regular Homeowners Contribution. Should a homeowner fail to pay their required portion, a lien will be placed on the respective homeowner's home until they have met their financial obligation, therefore, this is a fail-safe layer of financial protection for the Government. Finally, so as to provide an additional layer of comfort, a $1 million bond will be put in place by the developer in favour of the Government to ensure that adequate coverage is in place to address the cost of ongoing dredging for requirements extending indefinitely into the future.

The results of the model simulations for the jetty option under daily conditions using LITPACK (Section 10.3 in the Coastal EIA report), indicated that the movement of sand occurs predominantly within a distance of 50-60 m from the shoreline. These results confirmed and reflected the results of the GENESIS modeling (Section 10.2.3 in the Coastal EIA), which indicate that a 70m-long structure would obstruct any sand movement in the near shore area.
With the jetty inlet structures as proposed, it is very unlikely that there will be any significant migration of sand from the eastern side of the jetties into the channel, as the alongshore net movement of sand will be stopped completely under daily conditions. The channel will therefore not act as a sink to sand moving along the shoreline on a daily basis. The EIA document has highlighted this and has called for the setting up of a sand bypassing program as a mitigation strategy.

No-Jetty Design Option
As requested by Black and Veatch, the alternative option of designing the marina without the inlet structures was investigated. During the analysis of this alternative, the following issues were considered and should be noted:

- **Even if the inlet structures are not constructed, the entrance channel will still represent a total barrier to the alongshore sediment transport, as it would behave as a littoral sink. Given the area where most of the sediment transport occurs (50-60 m from shoreline), the entrance channel could be potentially filled with sand in the vicinity of the marina entrance over time;**
- **As a result, there would not be any initial accumulation of sand to the east of the property boundary limits; however, due to the presence of the channel (acting as a sediment sink), erosion would still occur to the west of the marina entrance, in the immediate vicinity of the entrance channel;**
- **In addition, bigger waves could potentially propagate inside the marina basin during hurricane and swell events, making the operation of the marina more difficult and**

giving rise to potentially hazardous navigational entrance conditions during stormy times.

Channel Infilling for the no-inlet structures option

The channel design as currently proposed is based on a depth of 4.9 m (16 ft). So as to evaluate the merits of a no-jetty option while accounting for the dredging that will occur on a more frequent basis with no jetties, two other scenarios have been modeled. As a potential way to overcome the issue of unacceptably more frequent dredging, we have looked at initially "over-dredging" the channel to a depth of 5.9 m (19.5 ft) and 6.9 m (23 ft) within a zone of 50 m (160 ft) from the shoreline. By initially "over-dredging" the channel it would allow the channel to act as a sediment sink, in order to reduce dredging frequency.

Table 2.1 below presents the results of the sensitivity analysis, indicating the anticipated frequencies of the dredging operations, for alongshore sediment transport rates ranging from Q = 500 to 2000 m^3/year, and channel depths ranging from 4.9 m (16 ft) to 6.9 m (23 ft). The range of transport rates (Q) bracket the predicted value of 1500 m^3/year, and take into account the fact that the seabed in the vicinity of Albany may have sand limited conditions.

This sensitivity analysis shows that if the channel depth is set at 4.9 m (16 ft), dredging operations would potentially have to be performed every 1 to 5 months, depending on the actual annual sediment transport rate. This is considered to be too frequent, given the associated environmental issues.

By initially over-dredging the channel depth to 5.9 m or 6.9 m along the length of channel where most of the sediment transport occurs (about a 50-m long stretch), the frequency of dredging is seen to decrease to between every 5 to 20 months and between every 11 to 43 months respectively.

Table 2.1 Period of re-dredging activities for various sediment transport rates – No jetties

Sediment Transport Rate, *Q* (m^3/year)	Depth of Channel		
	4.9 m (16 ft)	5.9 m (19.5 ft)	6.9 m (23 ft)
	Time between re-dredging (months)		
500	4.8	19.2	43.2
1000	2.4	9.6	21.6
1500	1.6	6.4	14.4
2000	1.2	4.8	10.8

Channel Infilling for the jetty option

As a point of comparison and as presented in the EIA, we estimate that dredging will be required once every 3 to 4 years for the jetty option.

Conclusions

- **The analysis indicates that even without the inlet jetties, the entrance channel still represents a barrier to the alongshore sediment transport. This will clearly result in a faster infilling of the entrance channel and therefore will require a higher frequency of dredging operations. The actual expected frequency of dredging for a range of conditions has been given in Table 2.1 above.**
- **If the dredging operations are performed regularly and the sand is extracted from the channel and deposited along Albany beach, the erosion impacts would be significantly reduced in this area. However, the frequency of the dredging operations would have an impact on the operation of the marina, as well as an environmental impact due to the turbidity levels resulting from these operations.**
- **Further, it must be noted that even for the no-jetty option, some protective inlet structures would be required across the beach, in order to stabilize and preserve the integrity of this channel. It is therefore the intention that in the final marina design the developer will aim to minimize the length of the inlet jetties.**
- **Due to the risks of severe storm events filling in the marina entrance and creating additional problems and the disruption that would occur due to "over-frequent" dredging of the channel, the proposed inlet jetty structures are recommended to be used at Albany.**

Recommendations

In response to questions raised by Black and Veatch regarding the EIA, clarifications have been presented on issues relating to the feasibility of having no jetties at the entrance of the marina. Coming out of these investigations and the clarifications presented in this document, the following recommendations are made.

- **It is recommended that the present jetty configuration be retained at this stage (jetty lengths of 40 m and 70 m, respectively) as this serves the purposes of:**

  - **Providing a managed beach system which will need to be dredged at least every 36-48 months, with the sand being bypassed to the down drift side of the channel;**
  - **Providing protection against storm waves for vessels entering and/or exiting the marina, a feature that is expected to be provided in a world-class marina such as this;**
  - **Similarly, providing protection against the possibility of sudden or catastrophic channel closure as a result of excessive sand movement during a storm, thereby ensuring that any emergency response vessels that may have sheltered in the marina during a storm would have ready access to the open sea immediately after the storm;**
  - **Reducing the environmental impacts resulting from turbidity associated with the dredging operation.**

- **During the detailed design process, every effort should be made to further fine-tune the jetty layout, with the possibility for further shortening of these structures. Final design**

considerations will include: wave sheltering, channel characteristics, sand bypassing requirements, economic evaluations and cost-benefit analyses and cross-sectional design considerations. It is anticipated that Black and Veatch will continue to act as the reviewing agency for BEST, so a transparent process is expected to be in place right through the design stage of the project.

Confirmation on proposed source of sand alternative to source for sand mining and company intended to use license and permit for sand mining activity.

During the initial renourishment phase, additional sand will be needed as stated in the EIA. This will be supplied by Country Sand Ltd. Please find attached a letter of approval from the Department of Lands and Surveys for sand dredging by Country Sand, Exhibit H, and a copy of the license to extract sand, Exhibit I.

Flushing Model
Clarify tidal phase used and verify that similar results will be given if the simulation was started under a different tidal phase.

Water Quality Modeling: Sensitivity Analysis

In the water quality modeling carried out for the EIA, a conservative pollutant was discharged in the center of the marina and its dispersion tracked after the initial release. The water quality model used in the simulations was the RMA-11 model, which was used to examine and optimize the flushing characteristics of the proposed marina. The initial pollutant concentration used was 50 mg/l, which was released for a period of 4 hours. The water quality model was then run to simulate a 19-day period. During the simulation, the pollutant was allowed to disperse and be affected by the tidal current patterns, which had been previously determined from the hydrodynamic model. A constant wind speed of 2 m/s to the north-west was applied in the modeling.

For the EIA investigations, the pollutant was released during the rising tide, which generally constitutes a worst case scenario, as tidally driven water is entering the marina during this stage. As was presented in the EIA report, shows snapshots of the concentration of the arbitrary pollutant constituent at release and after 24 hours. It should be noted that these conditions represented a *spring* cycle, when tidal excursions are maximized.
In response to the questions raised at the above referenced meeting, the simulation was repeated, but with the pollutant released during the rising *neap* tide, when tidal excursions are minimized. Figure 0.1 shows the marina water quality at the start of the pollutant release and 24 hours afterwards, for this condition.

These two simulations indicate that there is no significant difference in the dispersion patterns within the marina, with regard to water quality, within the 24-hour period following the pollutant release. That is, the marina behaves very similarly during either *spring* or *neap* tide, in terms of its ability to disperse the introduced pollutant, and the indicated pollution concentration after that period of time falls to between 1-3 mg/l.

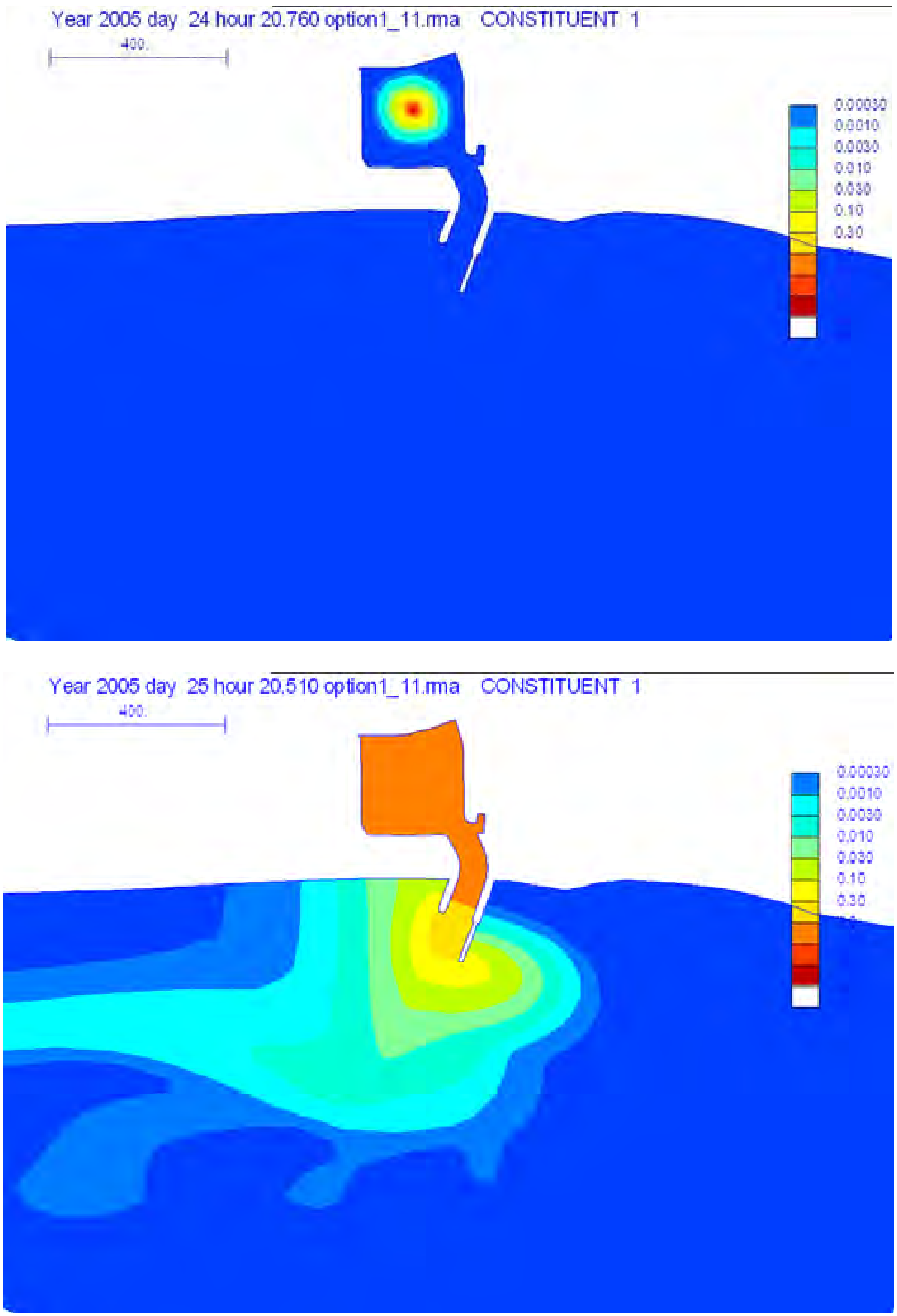


Figure 2.1: Marina water quality at start of pollution and 24 hours after the pollutant was released, Rising Spring Tide.

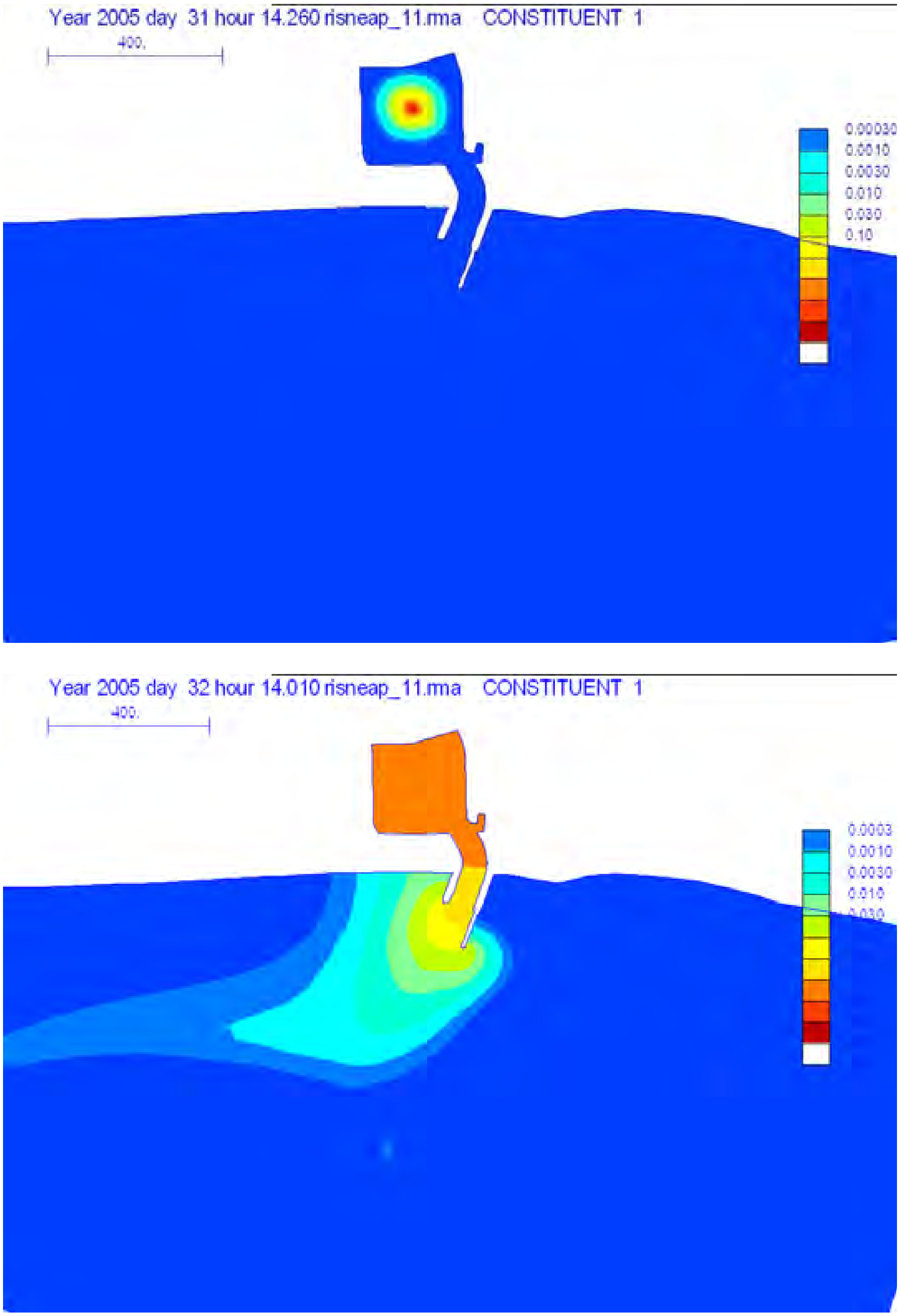


Figure 0.1 Marina water quality at start of pollution and 24 hours after the pollutant was released, Rising Neap Tide.

Confirm that the surge analysis was conducted with the jetties at their current length

The storm surge calculations were carried out with the jetties in their present location but with jetty lengths as presented in the Coastal EIA report (slightly longer jetties). Additional wave and storm surge computations are expected to be carried out with the jetties in their present proposed configuration at the final design stage of the project.

It should be noted however, that we do not anticipate any difference in storm surge heights within the marina resulting from variations in the length of the jetties. This is due to the fact that the storm surge phenomenon is characterized by a very long period wave, with a corresponding wave length that is many times larger than the scale or size of the jetties and the marina. As such, the storm surge does not "see" the individual jetty structures.

EIA Supplement 7

Comparison of Marina Hydrodynamics with and without Island

The hydrodynamics of the marina were investigated with and without an interior island. This investigation was carried out using the same finite-element hydrodynamic model, RMA-10, that has been used throughout the entire EIA process to evaluate current pattern predictions.

For this application, the hydrodynamic model was set up to simulate a 72 hour period in order to investigate the difference in velocity in the marina with and without the interior island during a full tidal cycle incorporating the rising and falling tide periods. The time series results of current velocities and directions, over the 72 hour period, were investigated at two locations within the marina. The first of these was inside the marina entrance at the bend in the entrance channel, and the second was inside the marina in the west-central area.

In addition, a comparison was made of the 2-dimensional spatial plots of the current patterns for the marina with and without the island. These diagrams are shown in the figures following.

The bathymetry for the marina is shown in Figure 1 following, with and without the island.

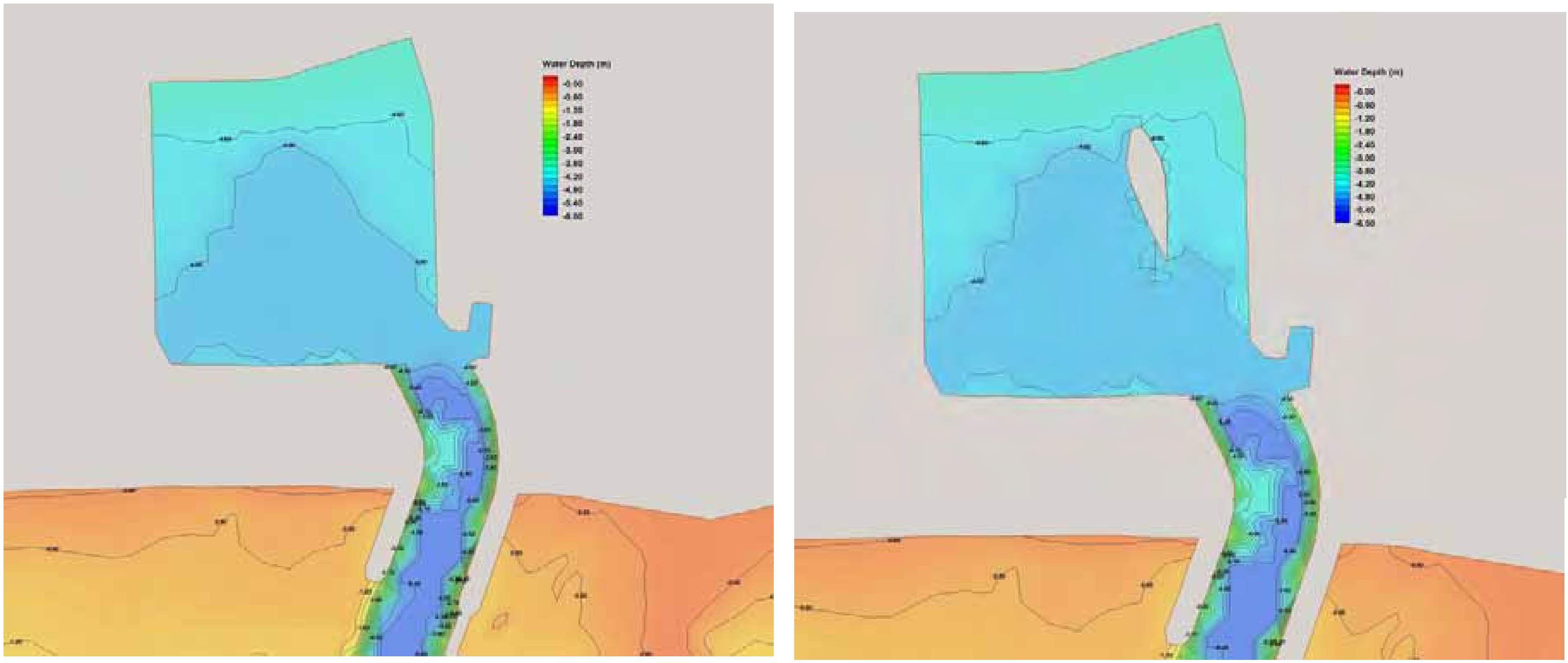


Figure 1 Bathymetry of both marina options

The time series of current speeds observed within the marina (Figure 2) shows that the effects of including the island within the marina introduce only slight changes. As expected, on the peaks of the tidal cycles, the current velocities are slightly higher with the island in place than without the island. This effect is expected due to the aerodynamically shaped configuration of the proposed island. In summary therefore, the introduction of the island within the marina is not expected to have an adverse effect on the currents within the marina, therefore, the water quality is expected to be the same or slightly better than for the marina without the island.

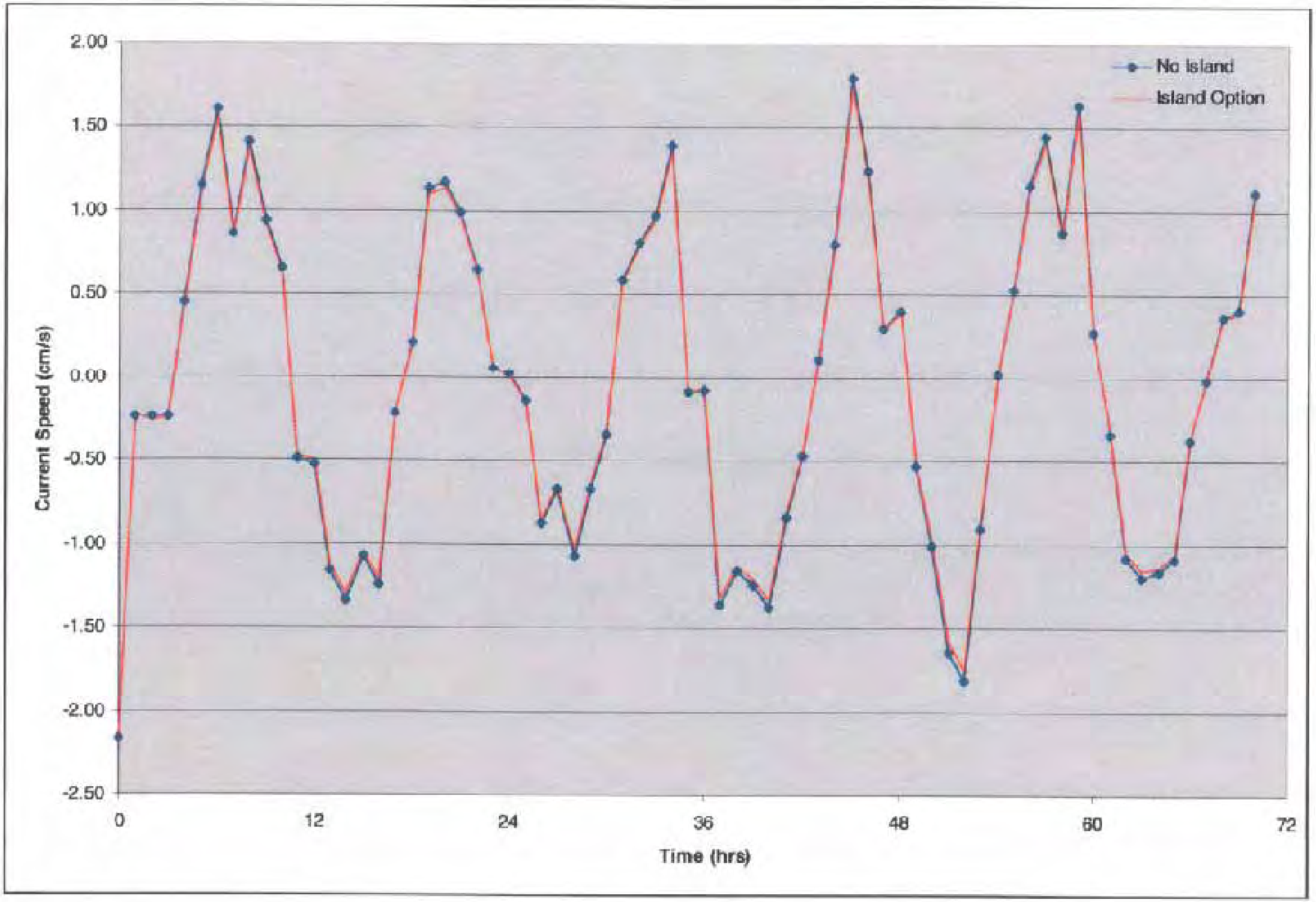


Figure 2 Times Series of current velocity inside the marina

Inside the marina entrance (Figure 3), the results show no difference between the "with island" and "no island" layouts. This is most likely due to the fact that the impact of the island in reducing the water area (and volume) within the marina is not felt with any significance in the entrance. It should also be noted that currents are much higher, as expected, in the marina entrance than within the marina itself. Because of this, no difference is expected in the performance of marina as regards water quality, with, or without, the marina.

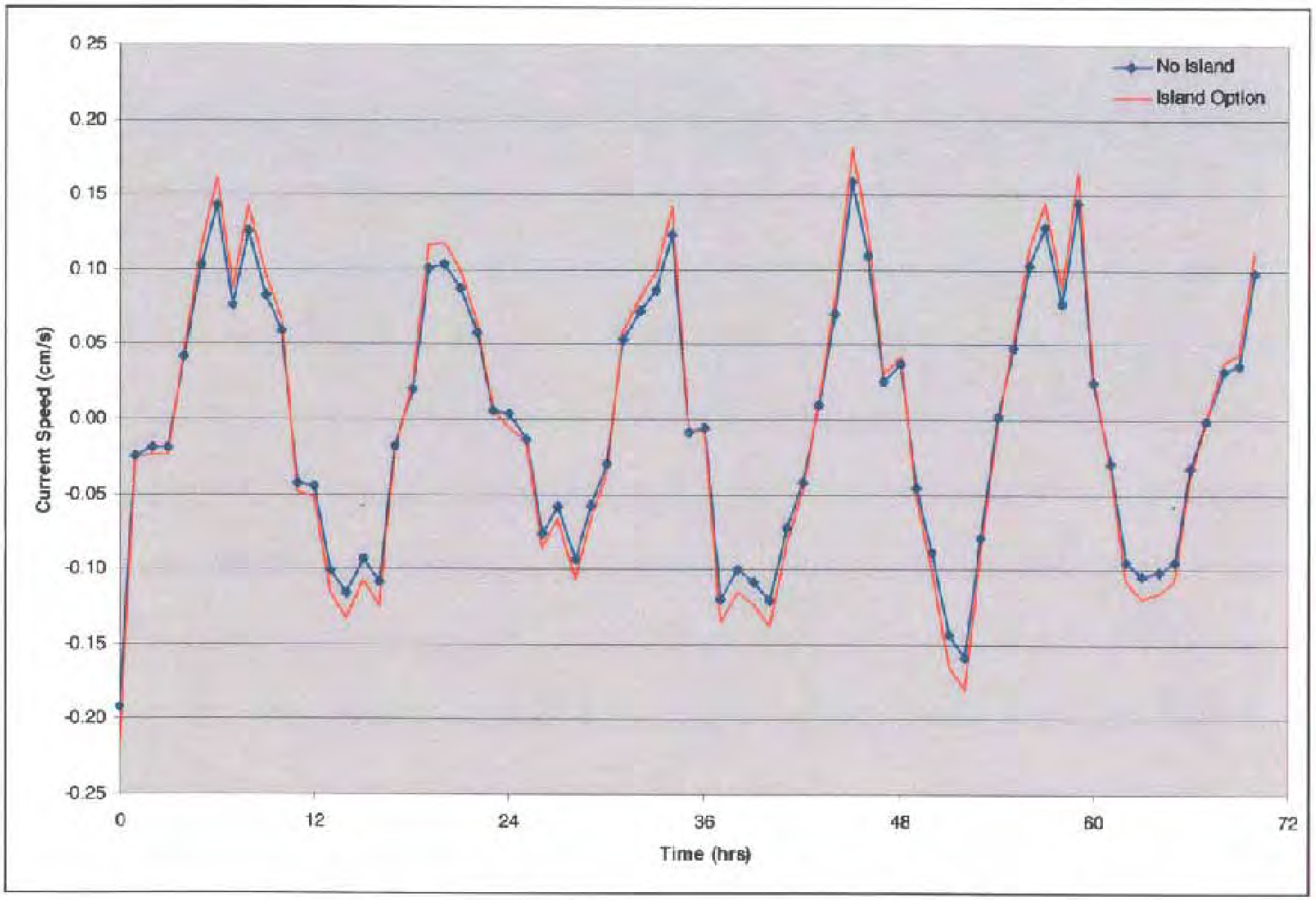


Figure 3 Time series of current velocities inside the marina entrance

The following two figures show the current speeds in a plan view format with and without the island in place. These diagrams show some small local accelerations of flow around the island, however these are not considered to be major. The results indicate, as stated above, that the effects on current patterns and water flushing for the case with the island, will be similar to that for the previous case without the island.

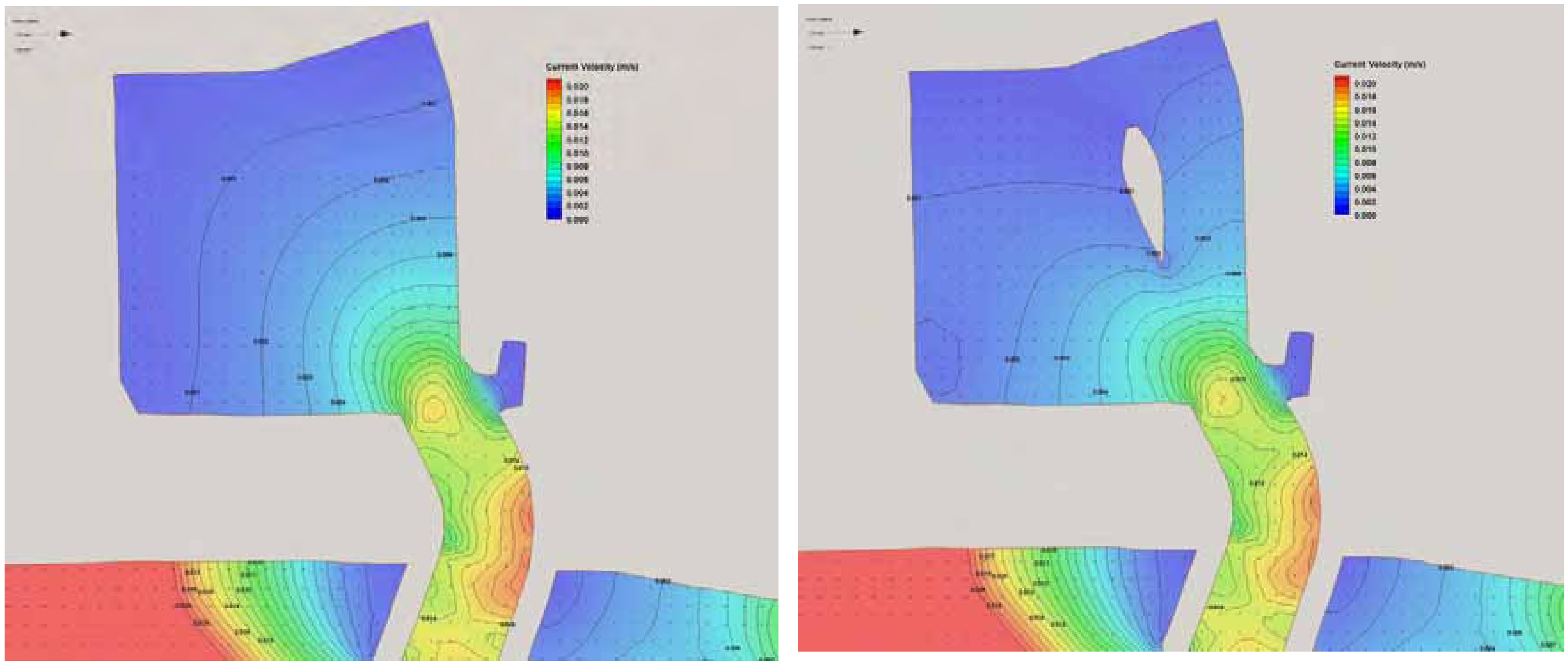


Figure 4. Current Velocities during a rising neap tide cycle.

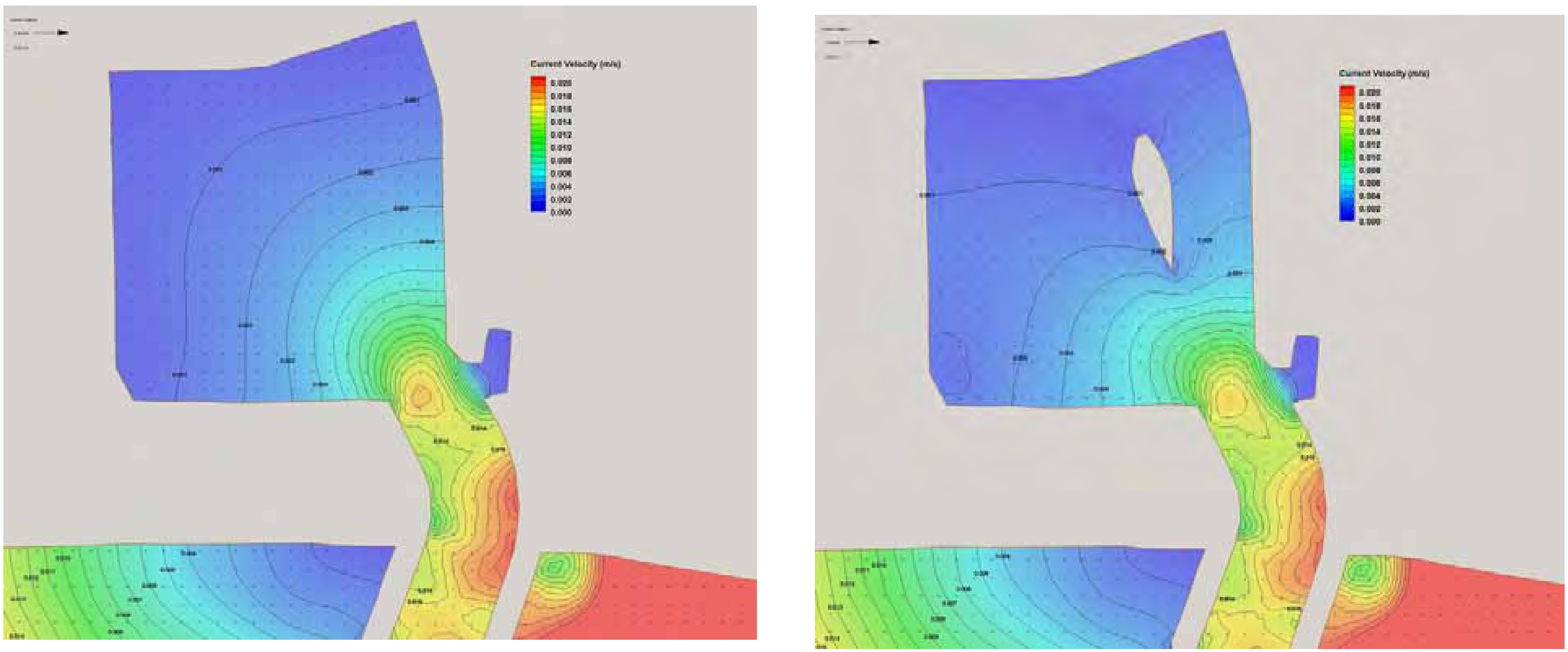
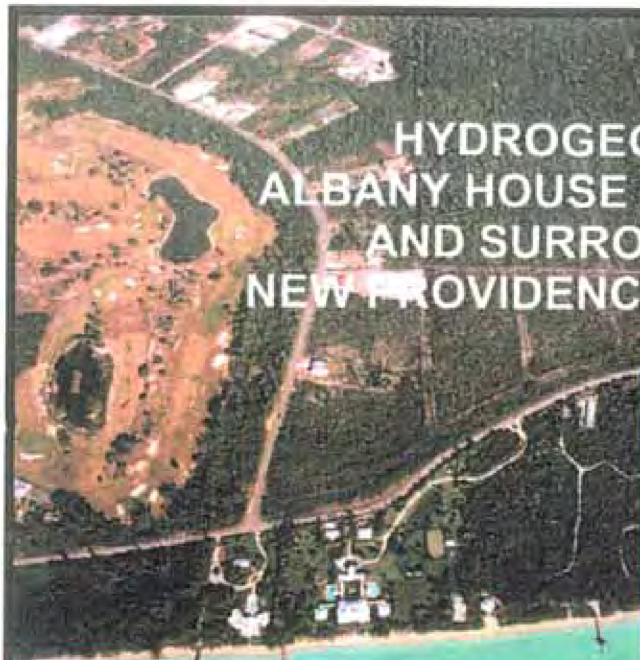


Figure 5. Current velocities during a falling neap tidal cycle.

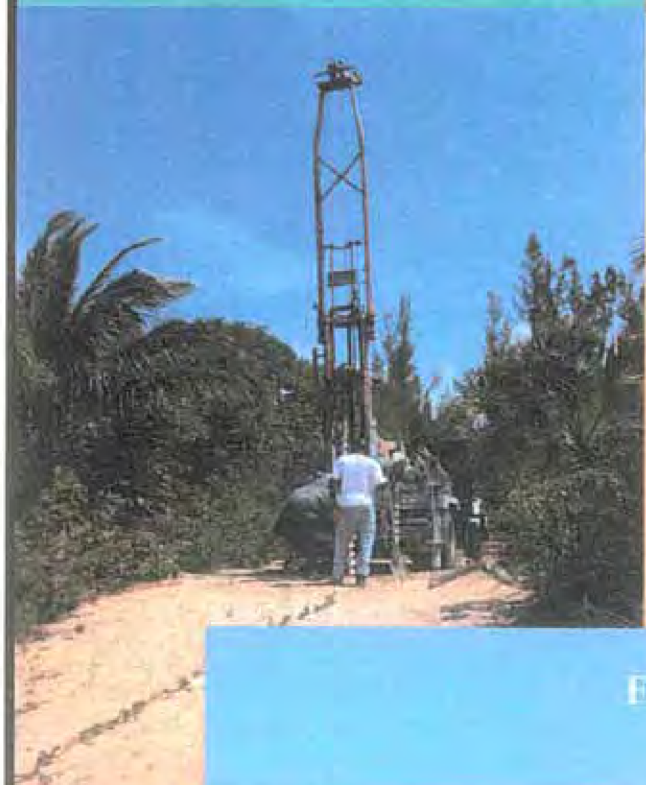
APPENDIX III

HYDROGEOLOGICAL INVESTIGATIONS

HYDROGEOLOGY OF THE ALBANY HOUSE DEVELOPMENT SITE AND SURROUNDING LANDS NEW PROVIDENCE ISLAND, BAHAMAS



Prepared for
New Providence
Development Corporation, Ltd.
Nassau, Bahamas



Prepared by

Halltech Environmental
and
Geotechnical Consulting Services
Provindenciales, Turks, and Caicos
Islands

And

Missimer Groundwater Science, Inc.
Fort Myers, Florida

FINAL REPORT
July 2005

HYDROGEOLOGY OF THE ALBANY HOUSE DEVELOPMENT SITE AND SURROUNDING LANDS, NEW PROVIDENCE ISLAND, BAHAMAS

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Fort Myers, Florida

THOMAS M. MISSIMER
LICENSE
No. 144
STATE OF
FLORIDA
PROFESSIONAL GEOLOGIST

Thomas M. Missimer, Ph.D., P.G.
Professional Geologist #144

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Section 1
Conclusions and Recommendations

1.1 Conclusions

The Albany House development is proposed to be constructed along the southwest coast of New Providence Island in the Bahamas. The project will be constructed on about 525 acres of property. A marina containing about 100 slips (+/-) is proposed for construction on the south side of the project. The marina is a deep water facility with an access channel depth of about -17.5 feet below mean sea level and the north part of the basin will have a depth of about -16.5 feet below mean sea level. The remaining part of the development will include a championship golf course, 350 single-family residential units, 150 multi-family residential units, and some mixed use commercial property.

Potable water use for the development will be provided by a connection to the government potable water supply system. The estimated peak day potable water use for the project is about 258,000 gallons per day (gpd).

Irrigation will be required for both the proposed golf course and the landscaped common grounds. The estimated irrigated acreage for the golf course and landscape areas are 80 and 60 acres, respectively. The estimated peak day irrigation water use for the project is nearly one million gpd.

A series of hydrogeologic and water quality investigations were conducted on the site to assess the impact of the proposed marina on the groundwater system, the potential use of water from the freshwater lens beneath the development site, and an assessment of possible impacts of the development site on the remaining part of the water fields to the north and east. It was found that the hydraulic conductivity of the Lucayan Limestone aquifer varied from 3 to 10 feet per day (ft/day) from land surface to a depth about 35 feet below surface and increased to 100 ft/day at about 55 feet. The hydraulic conductivity increased to at or above 1000 ft/day at 55 feet and remained close to that value to over 100 feet below surface based on a comparison to the studies made on Andros Island. Test wells drilled into the Lucayan Limestone aquifer showed that water quality varies in the aquifer south of Adelaide Road. Freshwater, defined as having a dissolved solids concentration at or below 500 milligrams per liter (mg/l), occurs beneath 60 percent of the proposed marina site. Most of the development site lying north of the road contains freshwater ranging in thickness from 0 to over 30 feet. The areas where freshwater does not exist are associated with over-pumping of the water fields trenches.

A groundwater model was constructed to assess the impacts of the marina on water quality within the freshwater lens. The model showed that the impacts will be primarily vertical rather than horizontal. Based on the model results, the marina will influence water quality in the aquifer only to a distance of less than 300 feet to the north and equally to the east and west. These effects are minor. There is always some uncertainty in the output of a model based on the quality of the data input. A key consideration is the hydraulic conductivity of the aquifer in the vicinity of the marina. If this parameter was significantly increased, the results of the model would show a greater area of impact within the aquifer. The use of a curtain wall on the northern side of the marina would significantly reduce the risk of greater impacts on the freshwater lens. Modeling of a curtain wall showed that it also reduces the discharge of freshwater into the marina basin by at least 25%.

A water budget of the development site north of Adelaide Road was made to estimate the sustainable yield of the Lucayan Limestone aquifer. About 235,000 gpd can be sustainably withdrawn for use in consideration of a 1- in 10-year drought. The withdrawal of this water could have been problematical because the original site development plan called for the construction of 60 acres of lakes that would penetrate into the freshwater lens. These lakes could have caused the occurrence of localized pockets of saline-water to move into withdrawal galleries or wells used to extract freshwater for use. In order to effectively withdraw the freshwater in the aquifer for use without adversely affecting water quality, the lakes would have to be isolated from the aquifer either by lining or by construction of the surrounding curtain wall. Because of the concern about the potential effects of the lakes, the area of lakes was reduced from 60 to 20 acres. This greatly reduces the concern about the impact to the freshwater lens. However, the design, operation, and monitoring of the withdrawal system will be necessary to maintain water quality and the withdrawal system must be designed with consideration of the lake locations. It is quite likely that there will be variations in the water supply from this area based on climatic condition changes.

About 900,000 gpd of freshwater could be withdrawn from the remaining 1500 acres of the water fields area. However, in order to withdraw water at this rate, a new scheme for harvesting the water would need to be implemented. The open trenches and small number of withdrawal points (pumps) would not allow the water quality of the lens to be maintained at this rate. Covered galleries with a large number of pumping stations would be the preferred withdrawal scheme.

1.2 Recommendations

1. The withdrawal of freshwater from the northern part of the project should not exceed 235,000 gpd.
2. The development of some freshwater and brackish-water could be accomplished south of the road with the brackish water being blended in a tank to meet the irrigation water quality requirements.
3. As much reclaimed water as possible should be used for irrigation.
4. Consideration should be given to the construction and operation of a seawater reverse osmosis water treatment facility to provide a significant portion of the irrigation water supply.
5. The irrigation water supply should be obtained from a combination of sources, including freshwater from the lens north of the road, reclaimed domestic wastewater, brackish water, and treated water from a seawater RO water treatment plant. Using

multiple water sources and mixing them will yield flexibility in drought years and during the grow-in of the golf course.

6. A storage tank for the irrigation water should be installed on-site. The capacity of this tank should be between 1 and 1.5 million gallons (MG).
7. In order to provide the maximum protection possible to the freshwater lens north of Adelaide Road, a curtain wall should be constructed along the northern perimeter of the marina and along limited sections of the eastern and western perimeter.
8. The depth of the curtain wall should be at least 19 feet below sea level at the north margin of the marina basin.

Section 2
Introduction

The project site lies on New Providence Island in the central part of the Bahamas (**Figure 2-1**). New Providence Island covers an area of about 80 square miles with the most highly developed area located in Nassau, which is on the coast of the northeast part of the island (**Figure 2-2**).

New Providence Development Company Limited (NPDC) owns approximately 5000 acres of land on the western part of New Providence Island and a portion of the property will be developed with a marina, a championship golf course, and a residential community on about 525 acres (**Figures 2-3 and 2-4**). The acreage is divided by Adelaide Road with about 70 acres south of the road and 455 acres north of the road. An aerial view of the site from the south is shown in **Figure 2-5**.

This report contains an analysis of the environmental impacts of the proposed marina and development on the freshwater lens underlying part of the development site. The specific objectives of this investigation were: 1) characterize the upper 50 feet of the unconfined aquifer beneath the site in terms of hydraulics and water quality, 2) add 25 additional monitoring wells to assess the water quality and use an electromagnet geophysical method to assess the water quality variation with depth, 3) perform some slug and bailer tests to determine the hydraulic conductivity of the aquifer, 4) use a tidal harmonic method to assess the variations in aquifer hydraulic conductivity, 5) assess the existing literature with regard to the aquifer geology and hydraulic character, 6) develop a groundwater flow and solute transport model to use in assessing the potential impacts of the marina on the freshwater lens and what remedial methods can be used to limit the impacts, 7) calculate a water budget for the development including the golf course area, 8) calculate a water budget for the NPDC wellfields, 9) assess the sustainable yield of the aquifer in the vicinity of the development, and 10) develop recommendations on the capacity of a seawater RO water treatment plant to provide supplemental irrigation water for the golf course and other landscaped areas. There are some additional issues with regard to the development that could affect the sustainability and use of the Surficial Aquifer for development of irrigation water. The use of lakes was assessed with regard to the impacts on the water budget and on water use.

FIGURE 2-1. Map showing the location of New Providence Island in the Bahamas.

FIGURE 2-2. Location Map of New Providence Island.

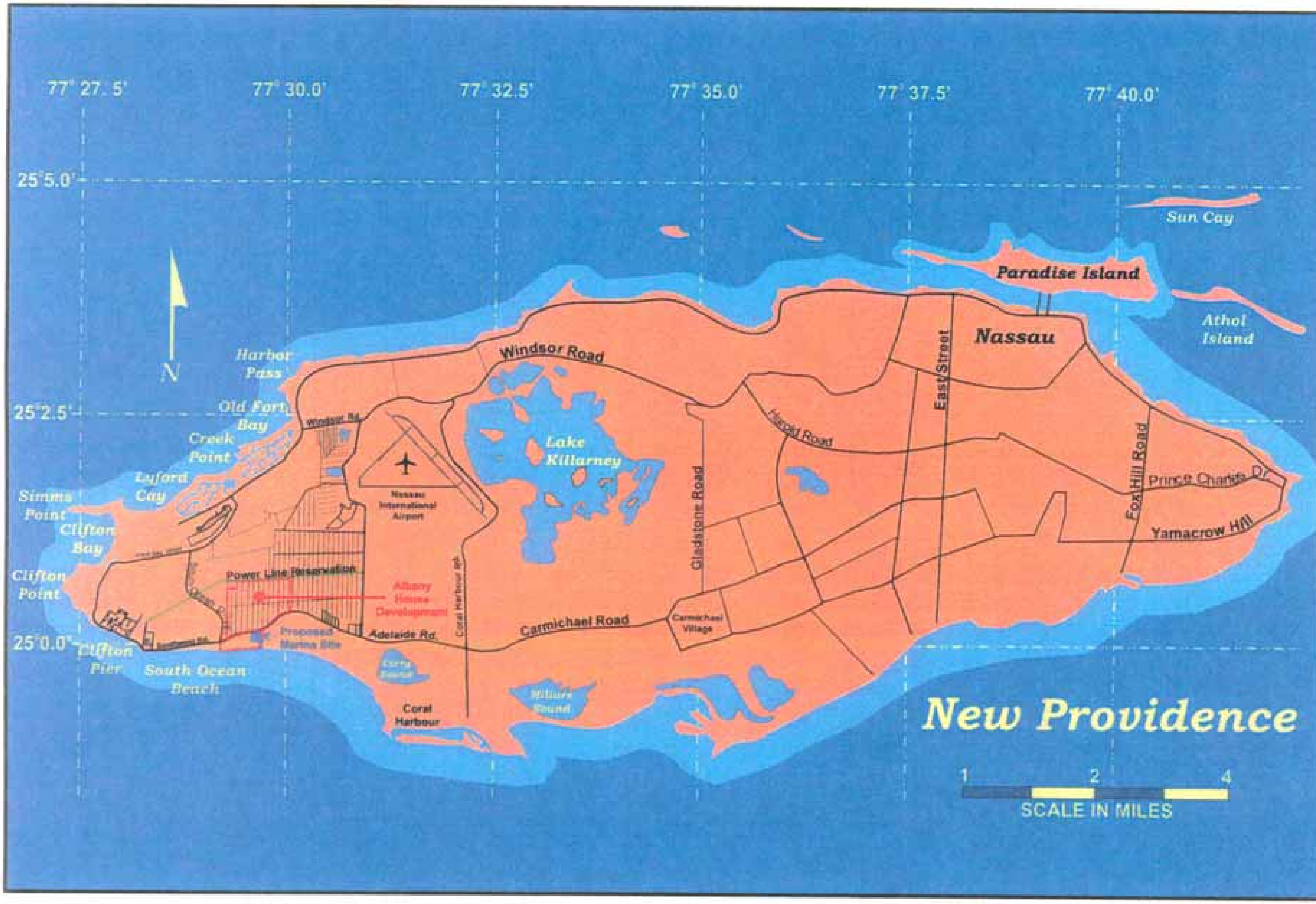

FIGURE 2-3. Map of New Providence Island showing the approximate development site boundaries.

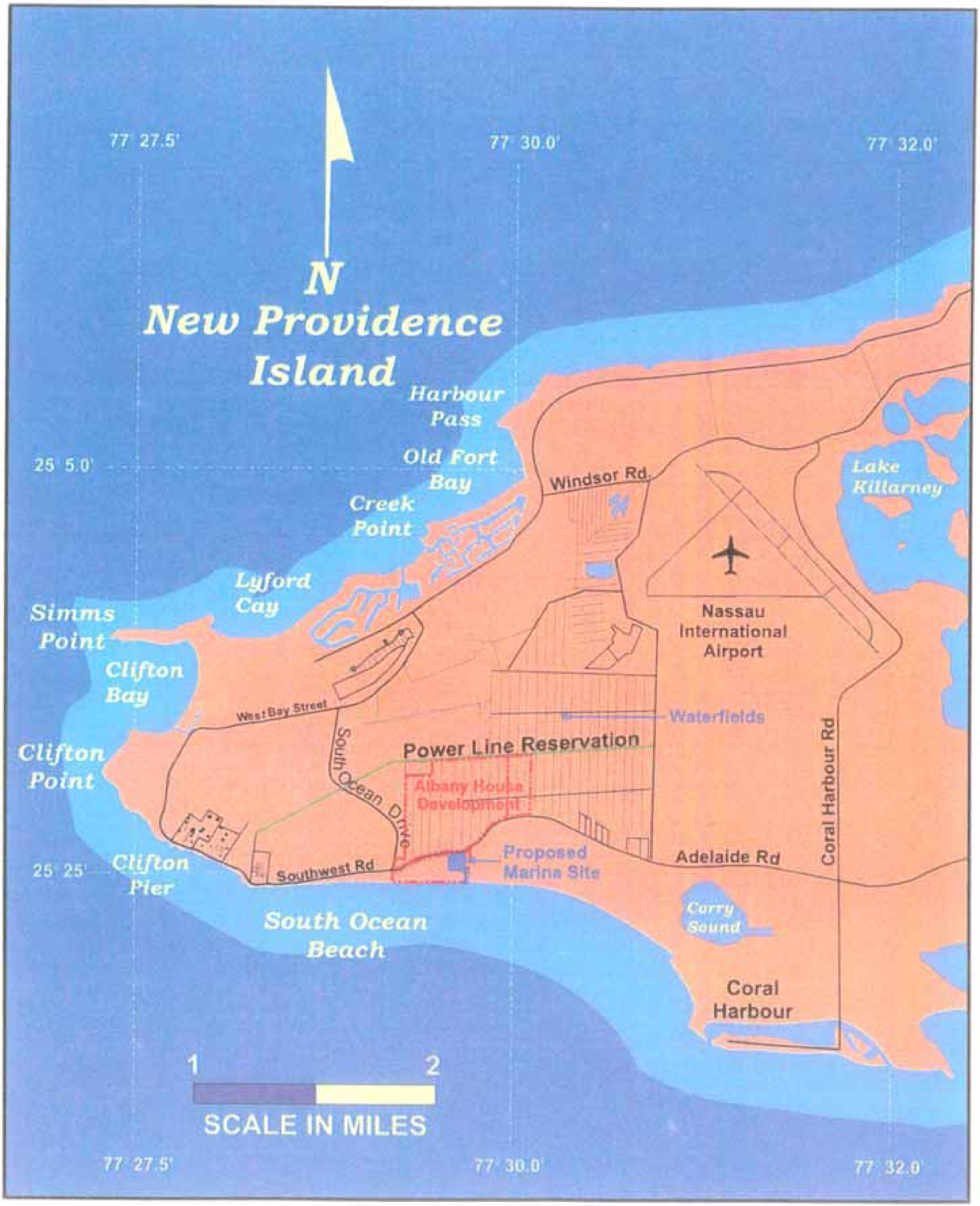

FIGURE 2-4. Map showing the development site boundaries, the proposed marina, and the waterfields.

FIGURE 2-5. Aerial view of Albany House development site from the south to north (from Turrell & Associates, Inc.).

Section 3
Climate of New Providence Island

3.1 Introduction

The climate of New Providence Island is controlled by the tropical climate of the region. In the summer season, the predominant wind direction is from the east, and the rainfall accumulation is affected by intense events associated with the passage of tropical waves and occasionally by tropical storms. In the winter months, the wind direction is variable and the northern part of the Bahamas is affected by numerous frontal systems as they pass from west to east. The southern part of the Bahamas is also affected by the stronger of the fronts, but to a lesser degree compared to the northern Bahamas. The intense tropical climate also produces high rates of evaporation and transpiration.

3.2 Rainfall

There are at least two rainfall gages that are maintained on New Providence Island; one at the Nassau International Airport (**Figure 2-4**) and one at the water treatment plant in the water fields. There is a long-term record from the gage located at the international airport and a shorter term record from the gage maintained at the water treatment plant and water fields facility run by NPDC. The period of record for the airport rain gage is 44 years. A compilation of the rainfall data is given in **Table 3-1**. The data from 2004 were not available. An analysis of this data shows that the highest annual rainfall was 76.33 inches and the lowest was 36.37 inches. This is a rather extreme range in rainfall accumulation rates and is directly related to the number of tropical storms and waves that pass over the island during a given year. The average rainfall for the period 1961 to 2003 is 54.34 inches. An analysis of the 1- in 10-year drought for New Providence Island can be calculated by averaging the 4 driest years of record in the 43-year period or by the average of the driest year in each 10-year period of the record. These methods yield 1- in 10-year drought rainfalls of 39.03 and 39.73 inches/year respectively. Another important analysis of the rainfall data is for the average rainfall in a 5-year dry period. The period 1961 to 1965 showed an average rainfall of only 42.57 inches/year, which is nearly 12 inches below the long-term average. This is quite important in the planning process for water supply requirements for golf courses and ornamental plants.

3.3 Evapotranspiration

The potential evapotranspiration (PET) of the Bahamas region was calculated by Sealy (1985). In the southeastern Bahamas the calculated PET was 1500 to 1600 millimeters per year (mm/year) or 59 to 63 inches/year. In the northern Bahamas the calculated PET ranged between 1300 and 1400 mm/year or from 51 to 55 inches/year. Cant and Weech (1986) estimated the actual evapotranspiration to be about 1150 mm/year or 43.69 inches/year. Whitaker and Smart (1997) and Cant and Weech (1986) suggest that the planning value that should be used for recharge is 25 percent of the annual rainfall. An analysis by HallTech (2005a) showed that recharge rates, defined as rainfall minus

Table 3-1. Rainfall Data from Nassau International Airport, 1961-2003

Year	Rainfall (in.)	Year	Rainfall (in.)
1961	36.37	1982	45.99
1962	45.84	1983	63.42
1963	43.80	1984	59.34
1964	44.81	1985	61.26
1965	42.01	1986	41.44
1966	74.24	1987	66.55
1967	47.67	1988	61.42
1968	71.48	1989	52.97
1969	51.70	1990	54.82
1970	49.85	1991	64.89
1971	45.87	1992	43.54
1972	48.57	1993	53.63
1973	64.43	1994	43.80
1974	37.34	1995	76.33
1975	53.06	1996	58.84
1976	56.14	1997	64.69
1977	41.66	1998	46.82
1978	53.25	1999	50.68
1979	67.95	2000	54.32
1980	73.93	2001	73.58
1981	43.92	2002	60.42
		2003	43.17

High = 76.33 inches
Low = 36.37 inches

Average (43-year) = 54.34 inches

1 in 10-year drought = 39.03 inches

evapotranspiration, range between 8 and 12 inches per year, which yields a range of 15 to 22 percent of the mean annual rainfall. If the average annual rainfall value for the airport record is used and a 25 percent rate of recharge is assumed, the average annual recharge rate would be 13.58 inches per year. This appears to be quite high and it is assumed in this record that the 8 to 12 inches/year estimate is closer to a real value. It should be noted that in a 1- in 10-year drought period, the evapotranspiration rate could be sufficiently high to reduce recharge to a very low number. In these low rainfall years, it is likely that the thickness of the freshwater lens lessens.

Section 4
Site Geology

4.1 Introduction

New Providence Island is one of many islands that lie upon the Bahama Carbonate Platform. Deep test wells, seismic investigations, and dredging of rocks from the deep sea margins of the platform show that this feature has persisted since Late Jurassic time, when dolomitic carbonates and anhyridites were deposited disconformably upon earlier siliciclastic sediments (Tator and Hatfield, 1975; Meyerhoff and Hatten, 1974; Khudoley, 1967). During the Jurassic-Early Cretaceous, the Bahamas, Florida, and northern Cuba were welded together as a single, huge carbonate platform (Sheridan et al., 1981; Schlager and Ginsburg, 1981). Carbonate and evaporite sediments occur to depths greater than 14,000 feet below surface. The entire sedimentary section may be up to 30,000 feet in total thickness. The Bahamas Platform was separated from Cuba and Florida by deep troughs (Schlager and Ginsburg, 1981) and periodically deformed by some tectonic events (Missimer and Maliva, 2004). In this investigation of the water resources only the upper 700 feet of sediments are of concern with the freshwater lens occurring only within the upper 100 feet.

4.2 Shallow Stratigraphy of New Providence Island

A number of previous investigations have been conducted on the shallow geology of the Bahamas (DSS Engineers, Inc., 1970; Beach, 1980; Beach and Ginsburg, 1980; Pierson, 1982; Rossinsky et al., 1992; Dawans, 1988; Garrett and Gould, 1984; Mylroie et al., 1991; Carew et al., 1992; Carew and Mylroie, 1995; Carew and Mylroie, 1997; Kindler and Hearty, 1997; Weech, 1997; Whitaker and Smart, 1997; Camp Dresser & McKee Inc., 1998; U. S. Army Corps of Engineers, 1984). These investigations were conducted for general research into carbonate sediment deposition as well as for the assessment of petroleum development potential, the water resources, liquid waste disposal, water supply development, and environmental impacts.

The shallow stratigraphy of New Providence Island has been determined from a series of boreholes drilled for obtaining water supplies for seawater RO water treatment facilities (DSS Engineers, Inc., 1970), for deep well disposal of concentrate and domestic wastewater (DSS Engineers, Inc., 1970; Weech, 1997), from academic research (Beach, 1980; Beach and Ginsburg, 1980; Garrett and Gould, 1984; Dawans, 1988), from a series of shallow test pits extending up to 6 feet below the water table (HallTech, 2005a) and from a series of shallow boreholes drilled for this project (HallTech, 2005b).

The shallow stratigraphic section beneath New Providence Island consists of a series of Miocene and Pliocene dolomites (Dawens, 1988) capped by the Pleistocene Lucayan Formation (Beach, 1980; Beach and Ginsburg, 1980). Based upon the work of Dawans (1988), Miocene and Pliocene dolomites begin at the base of a test well at a depth of about 600 feet below surface and extend upward to about 160 feet below surface. The

Miocene-Pliocene boundary lies at about 440 feet below surface. The Pliocene section occurs between 160 and 440 feet below surface. The Pliocene dolomites have variable lithologies and quite high associated hydraulic conductivity values. The top of the Lucayan Formation lies at about 160 feet below surface or at about 140 feet National Geodetic Vertical Datum (NGVD). The thickness of the Lucayan Limestone varies between about 100 and 200 feet on New Providence Island based on various well logs and the altitude of some topographic high points on the island (personal communication with Richard Cant, Bahamas Water & Sewerage Corporation; Brad Waller, Hydrologic Associates USA, Inc., drilling contractor).

The Lucayan Limestone has a variable lithology based on the work of Beach (1980), Beach and Ginsburg (1980), and Garrett and Gould (1984). In boreholes across the Great Bahama Bank, the formation consists of ooid-rich peloidal grainstones and packstones with some wackestones (Beach and Ginsburg, 1980). The margins of the platform contain coral-coralline algal limestones. The oolitic limestone deposits are both marine and eolian deposits. Garrett and Gould (1984) mapped the surficial geology of New Providence Island, which is primarily outcrop of the Lucayan Limestone. In the NPCD property area, the sediment consists primarily of marine sediment. Based on observations made in the field, the lithology of the Lucayan Limestone is a friable ooidic, pelodial grainstone and packstone, which is partially cemented. The formation is separated into sequences or parasequences by a series of calcrete deposits which formed at exposure horizons or on marine hardgrounds. These calcretes are very well-cemented and have generally low permeabilities (Rossinsky et al., 1992). The calcrete deposits within the Lucayan Limestone provide internal confinement within the limestone and contribute to high horizontal to vertical hydraulic conductivity values.

Section 5
Site Hydrogeology

5.1 Introduction

There are three hydraulic units occurring within the shallow geologic section that influence the existence and geometry of the freshwater lens on New Providence Island (**Figure 5-1**). These units are: 1) the low hydraulic conductivity dolomite occurring in the Lower Pliocene to the top of the Miocene, 2) the high hydraulic conductivity dolomite occurring in the Upper Pliocene section, and 3) the moderate hydraulic conductivity limestone within the Pleistocene Lucayan Limestone. In areas where the low hydraulic conductivity dolomite is breached by vertical dissolution features (sinkholes or Blue Holes), the entire aquifer section is influenced by these features in terms of flow and water quality.

5.2 Lower Pliocene Low Hydraulic Conductivity Unit

The top of this relativity dense dolomite unit may be considered to be a boundary for the circulation of deeper seawater that wells up from below in the middle of the Bahamas Platform based on the thermal circulation model of Whitaker and Smart (1990). There is considerable evidence that injection wells cased to the base of this unit do not have problems with the upward migration of wastewater based on density-driven flow (Weech, 1997). Although the unit is not truly a confining bed or unit, because it is breached by vertical karst conduits, it does prevent the upward movement of low density, injected domestic wastewater. The extremely high horizontal hydraulic conductivity of the dolomite unit lying beneath the lower hydraulic conductivity unit likely causes the injected water to rapidly spread in the horizontal plane, thereby not allowing vertical head pressure to build and induce upward migration. Injection well casings are generally set between 440 and 460 feet below surface depending on the location of the base of the dense dolomite, the relief on the top of the unit beneath it, and on the location of dissolution features. The estimated depth to the top of the unit lies between 300 and 320 feet below surface in the based upon contacts with well drilling firms (personal communication with Brad Waller, Hydrologic Associates USA, Inc.). According to DSS Engineers, Inc. (1970), the low hydraulic conductivity unit ranged between 410 and 490 feet below surface at the Blue Hills power plant site.

Dawans (1988) conducted some hydraulic conductivity measurements on the dolomites from this unit. He found that the hydraulic conductivity measured from plugs in the laboratory ranged between 0.01 and 0.07 ft/day. These values are based upon small samples and are not representative of the unit as a whole.

It is likely that the horizontal hydraulic conductivity of this unit ranges from 0.1 to 100 ft/day based on the comparative values found in similar units in Florida. The vertical hydraulic conductivity likely ranges from 0.01 to 1 ft/day. The ratio of horizontal to vertical hydraulic conductivity likely ranges from 10 to 1000.

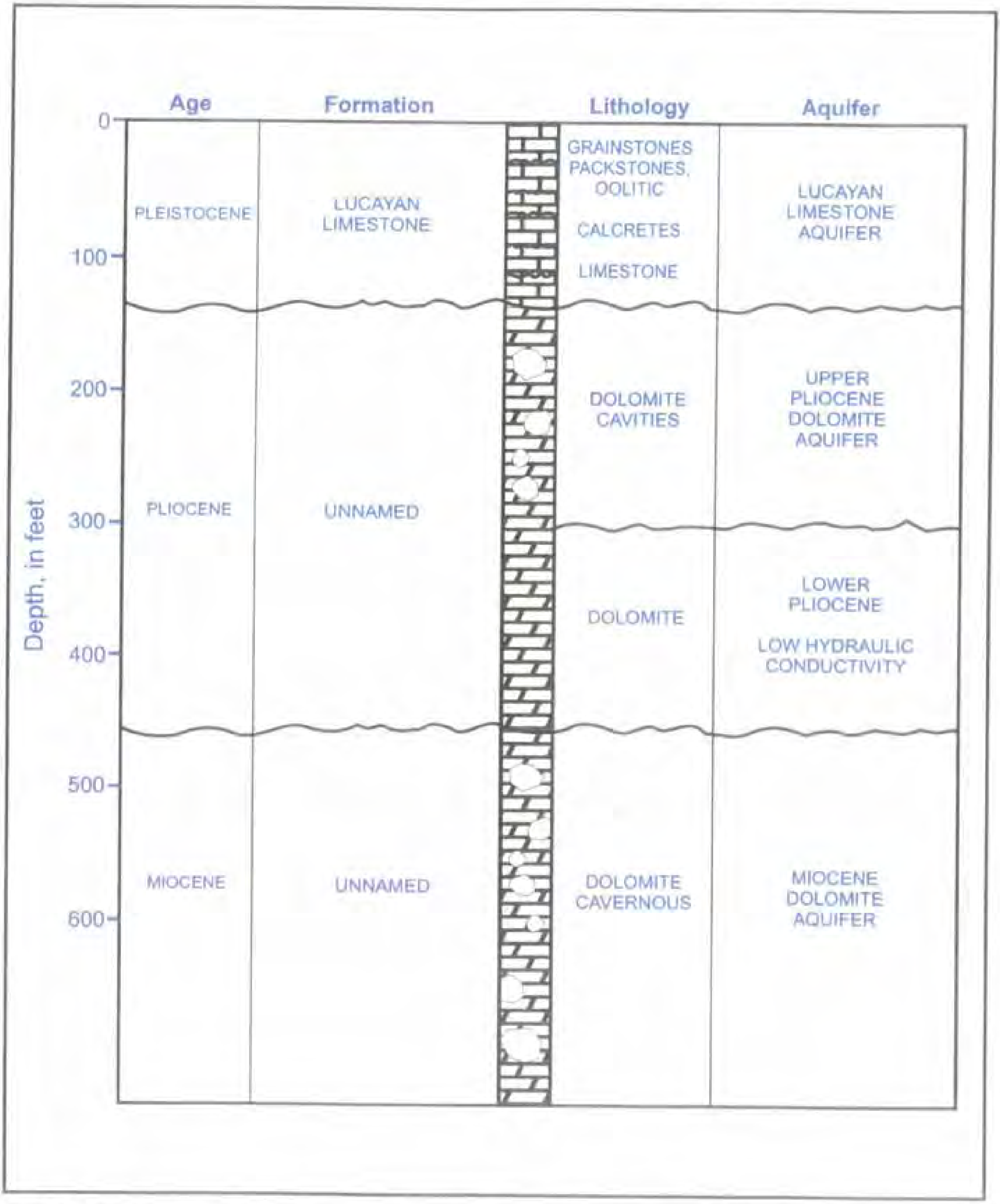

FIGURE 5-1. Generalized hydrogeology of New Providence Island.

5.3 Upper Pliocene Dolomite Aquifer

The Upper Pliocene dolomite aquifer is commonly used to obtain water to feed seawater RO treatment plants and for power plant cooling, such as the one at Blue Hills (DSS Engineers, Inc., 1970). Wells tapping this aquifer have yields ranging from 2000 to 3000 gallons per minute (gpm). In a series of individual well pumping tests at Blue Hills, drawdowns of 6 feet or less were recorded in each of the production wells for a pumping rate of 2920 gpm over a 12-hour period. There were 5 pumping tests conducted and in 4 of the tests the initial drawdown recorded was about 2 feet with one of the tests being 1 foot. Interferences between production wells at Blue Hills were less than the influence of the tides and could not be measured. Tidal-related fluctuations of water levels were about 3 feet, which correlates to the natural maximum tidal range of 3.4 to 3.5 feet, yielding a tidal efficiency ranging from 86 to 87 percent. Some of the wells were less than 500 feet apart.

Based on the pumping test data obtained from consultants reports and discussions with Bahamian government officials, hydraulic values can be estimated for this aquifer. The estimated transmissivity is over 1,000,000 ft^2/day with a corresponding average hydraulic conductivity ranging from 5000 to 7000 ft/day. Another piece of evidence that this aquifer is highly transmissive and connected to the sea is the analysis of tidal fluctuations within the basal Lucayan Limestone and in the upper part of this unit. Measurements made by Little et al., (1973) and analyzed using the method of Ferris (1951) yielded transmissivity values on the order of 21,600,000 ft/day. This is not a reasonable value for the Lucayan Limestone aquifer, but does correspond to possible values for the Upper Pliocene dolomite aquifer. An estimated storativity is 0.001 to 0.0005. The leakance is on the order of 0.0015 1/days. Since the water pumped from the Pliocene dolomite aquifer shows no decrease in salinity during production and there is no significant reduction in the thickness of the freshwater lens, it is assumed that this leakance does not affect the freshwater lens. Therefore, the predominant vertical flow during pumping is from the bottom upward through the low hydraulic conductivity dolomite. The low hydraulic conductivity calcretes within the Lucayan Limestone and the dolomitic section also help to eliminate vertical stress on the freshwater lens from deeper aquifer pumping. Upward leakance during the test probably is via vertical solution conduits, either Blue Holes or sinkholes. Sea level declined over 300 feet during most of the Pleistocene interglacial periods (Schlager and Ginsburg, 1981). This contributed to the formation of the vertical solution features.

5.4 Lucayan Limestone Aquifer

5.4.1 Hydraulic Properties from the Literature

Few data have been collected on the hydraulic properties of the Lucayan Limestone aquifer on New Providence Island. Known values for the hydraulic conductivity of the "Pleistocene Aquifer" of the northern Bahamas are summarized in Whitaker and Smart (1997). The only hydraulic conductivity values given for New Providence Island were a series of packer tests, which yielded values from 0.3 to 3300 ft/day (0.1 to 1000 m/day)

(Smart et al., 1992; **Figure 5-2**). When various methods used to measure hydraulic conductivity of this aquifer on other islands were ordered based on the scale factor from permeameter tests to packer tests to slug tests to pumping tests to tidal lag studies, the hydraulic conductivity values increased from 0.1 to 0.5 to 318 to 1541 to 3936 to 21,600,000 ft/day, respectively.

Detailed studies of the Lucayan Limestone Aquifer were conducted at Andros Island to assess aquifer heterogeneity and variation of hydraulic conductivity with depth (Smart et al., 1992; Whitaker and Smart, 1997). Packer test, slug tests, and pumping tests yielded an average hydraulic conductivity of about 1000 ft/day (Whitaker and Smart, 1997b). However, hydraulic conductivity was not evenly distributed with depth into the aquifer. Whitaker and Smart (1997a) showed that near the top of the aquifer the hydraulic conductivity was at about 3 ft/day and increased to 1115 ft/day at a depth of 33 feet below surface. The hydraulic conductivity remained nearly constant from 33 to 66 feet in depth within this aquifer. The increase from surface to 33 feet in hydraulic conductivity is linear (**Figure 5-3**). The hydraulic conductivity was related directly to karst conduit and fracture development (**Figure 5-3**). It is quite likely that this same behavior in hydraulic conductivity occurs with depth at the New Providence Island site, but with perhaps some variation in the depth to a stable hydraulic conductivity.

Based on aquifer performance testing conducted at the Blue Hills site on New Providence Island, which included the lower part of the Lucayan Limestone and the upper part of the Pliocene Dolomite, the hydraulic conductivity values were over 1 million ft/day. However, while these large values may reflect the full thickness of the aquifer, including karst features within the aquifer, they are not representative of the hydraulic conductivity values in the vicinity of the project. A tidal lag investigation conducted at Andros Island also suggested a very high transmissivity at 22,000,000 ft/day (Little et al., 1973). It is quite likely that the part of the aquifer tested was in a karstic limestone influenced by hydraulic conduits connected to the sea.

The shallow test wells and the test pits in land owned by NPDC showed that the Lucayan Limestone in this area consists of fine-grained, oolitic/peloidal grainstones and packstones. These limestones are friable and poorly cemented. The hydraulic conductivities of similar, uncemented Holocene packstones and grainstones on the Great Bahama Banks were studied in situ and in the laboratory by Bennett et al. (1990). The laboratory determined hydraulic conductivity values for the sediments at a depth of about 6 feet below surface ranged from 6.2 to 15.9 ft/day. In situ measurements using a geophysical method yielded hydraulic conductivity values from 8.2 to 194.5 ft/day with an average of 123 ft/day. Halley and Harris (1979) measured the vertical hydraulic conductivity of some slightly cemented oolitic limestones at Joulters Cays. The sample measurements were conducted in the laboratory and yielded hydraulic conductivity values ranging from about 3 to 11 ft/day. The variation in the hydraulic conductivity of the samples collected in the vadose zone was less than those collected from below the water table. Also, the average hydraulic conductivity was higher in the sample collected below the water table at about 8.5 ft/day. These samples did contain less cement. It must be noted that the ratio of horizontal to vertical hydraulic conductivity in limestone

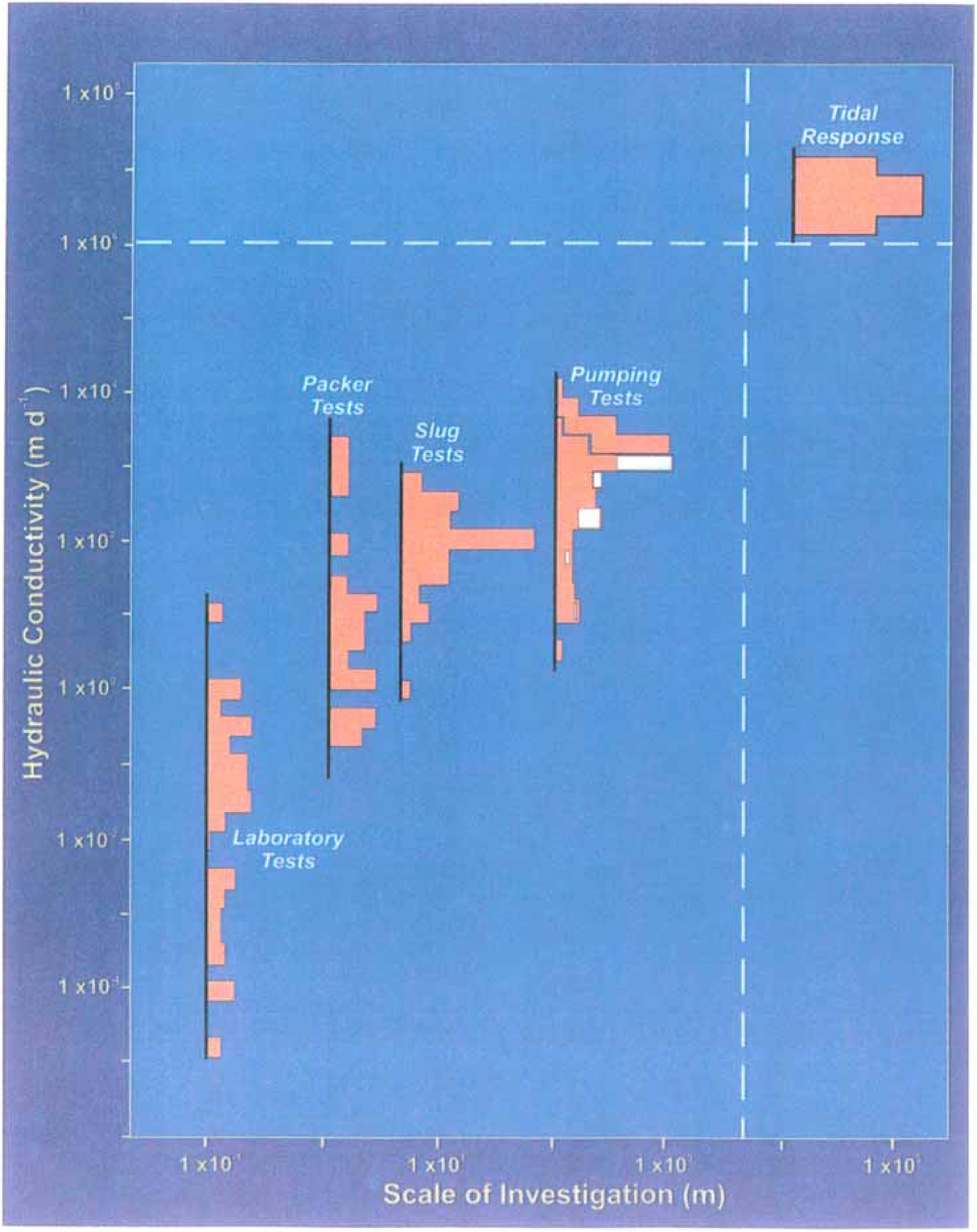

FIGURE 5-2. Hydraulic Conductivity data from the Lucayan Limestone Aquifer (After Smart and Whitaker, 1997).

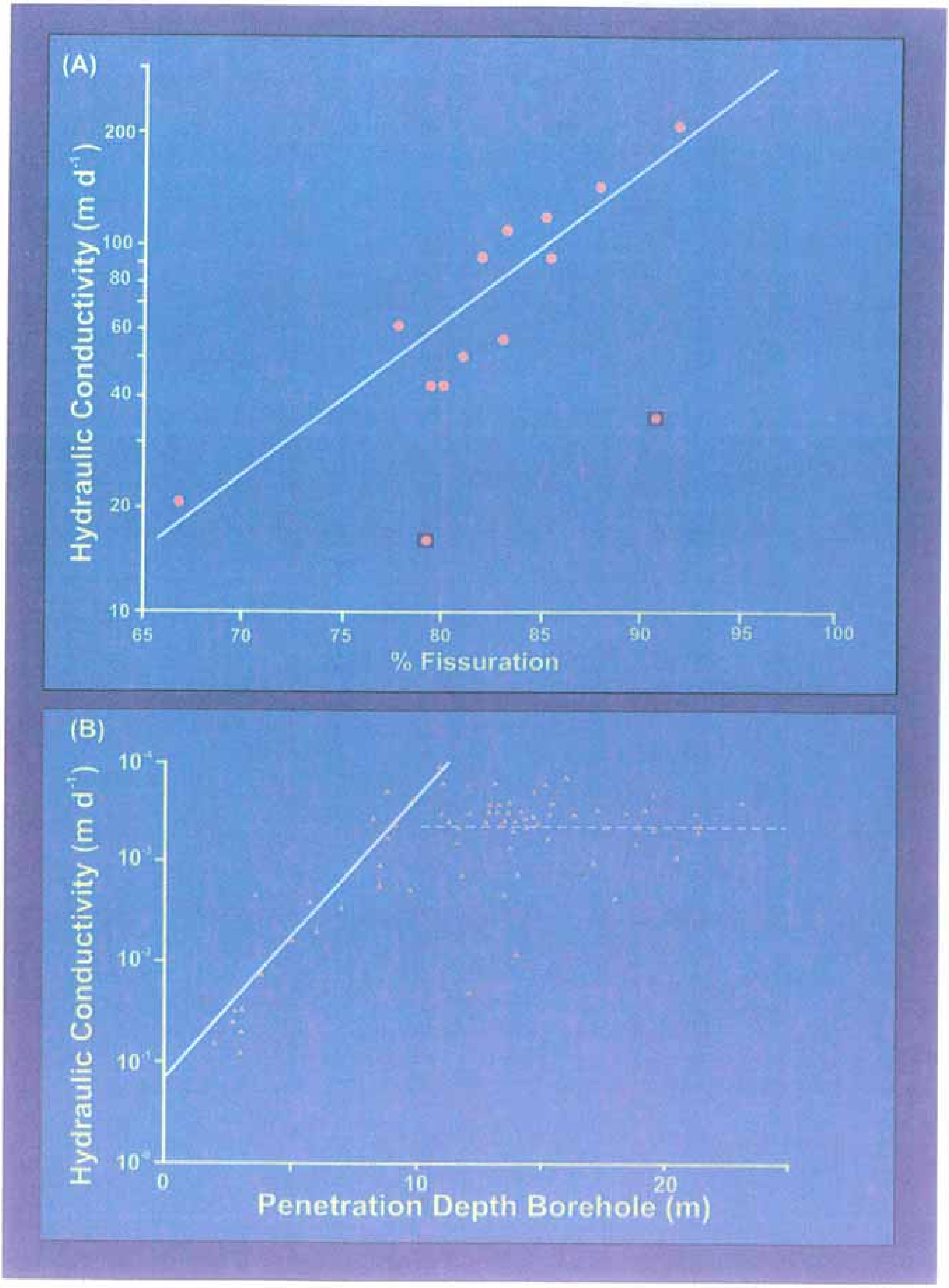

FIGURE 5-3. Hydraulic Conductivity with depth in the Lucayan Limestone Aquifer at Andros Island (from Smart and Whitaker, 1997).

typically ranges from 10 to about 1000. Therefore, the horizontal hydraulic conductivities of these samples were likely in the range of 30 to over 1000 ft/day, which is the typical range found within the Andros Island measurements for the upper part of the aquifer.

5.4.2 Porosity and Specific Yield

The porosity and specific yield of the Lucayan Limestone aquifer at this location was not measured. The best estimates for these values were obtained by Halley and Harris (1979) for oolitic deposits in the Joulters Cay area. These values ranged from 40 to 50 percent. Since there has been some cementation of the oolites in the limestones observed on-site, the porosity values will likely range from 35 to 45 percent with the calcrete units being 25 to 35 percent. Corresponding specific yield values for limestones of this type, (i.e., the Miami Limestone of southeast Florida) have a range from 0.1 to 0.35 with an average value of about 0.2 (Parker et al., 1955).

5.4.3 Field Testing at the Site

Two types of field tests were conducted to assess the hydraulic conductivity of the upper part of the Lucayan Limestone Aquifer at the site. Five slug tests and five bailer tests were conducted on a series of wells extending perpendicular from the sea north across the proposed marina site (wells 1, 8, 9, 11, and 13). Also, a series of recording pressure transducers were installed to record tidal pressure changes within the aquifer on five wells, beginning immediately adjacent to the beach and extending inland (north) a distance of about 400 feet.

The hydraulic conductivity data collected from the five wells generally followed the trend found in the Lucayan Limestone Aquifer at Andros Island, but the depth to the higher hydraulic conductivity sediments within the aquifer is greater than found at Andros Island. Slug and bailer test were collected using a pressure transducer to collect data at 10 second increments. The slug was a piece of PVC pipe at 3.5 inches in outside diameter with a length of 4 feet. The pipe was plugged at both ends and filled with sand to give it weight. The slug was inserted into the well rapidly to create a pressure pulse, which was recorded and the decline of the spike in pressure was recorded with time. The slug was later plugged rapidly from the wells to produce a bailer test causing a rapid pressure loss in the aquifer. The recovery of the pressure was recorded. The data from both the slug and bailer data were analyzed using the Hvorslev (1951) method. All of the data sets are given in **Appendix A**.

In two tests conducted on the shallowest penetrating well, number 13, the calculated hydraulic conductivity values for both the slug and bailer tests yielded values of 6.8 ft/day (**Table 5-1**). This test yielded a high quality data set that shows a hydraulic conductivity value of 10 ft/day or less is representative of the upper 15 feet of the aquifer (**Figure 5-4**). Slug and bailer data from wells 1 and 11 also yielded similar results with the hydraulic conductivities being 9.3 and 8.4 ft/day, respectively. The test data from well 8 were not of high quality and the low value for hydraulic conductivity of 3 ft/day is not considered representative of the full thickness of the aquifer penetrated. Well 9 yielded a

Table 5-1. Hydraulic Conductivity from Slug and Bailer Tests

Well No.	Open Interval (feet)	Hydraulic Conductivity (ft/day) Slug	Bailer
1	51.67	9.3	-
8	38.85	3*	-
9	36.2	64	32
11	32.84	8.4	2.7
13	13.17	6.8	6.8

*Questionable analysis

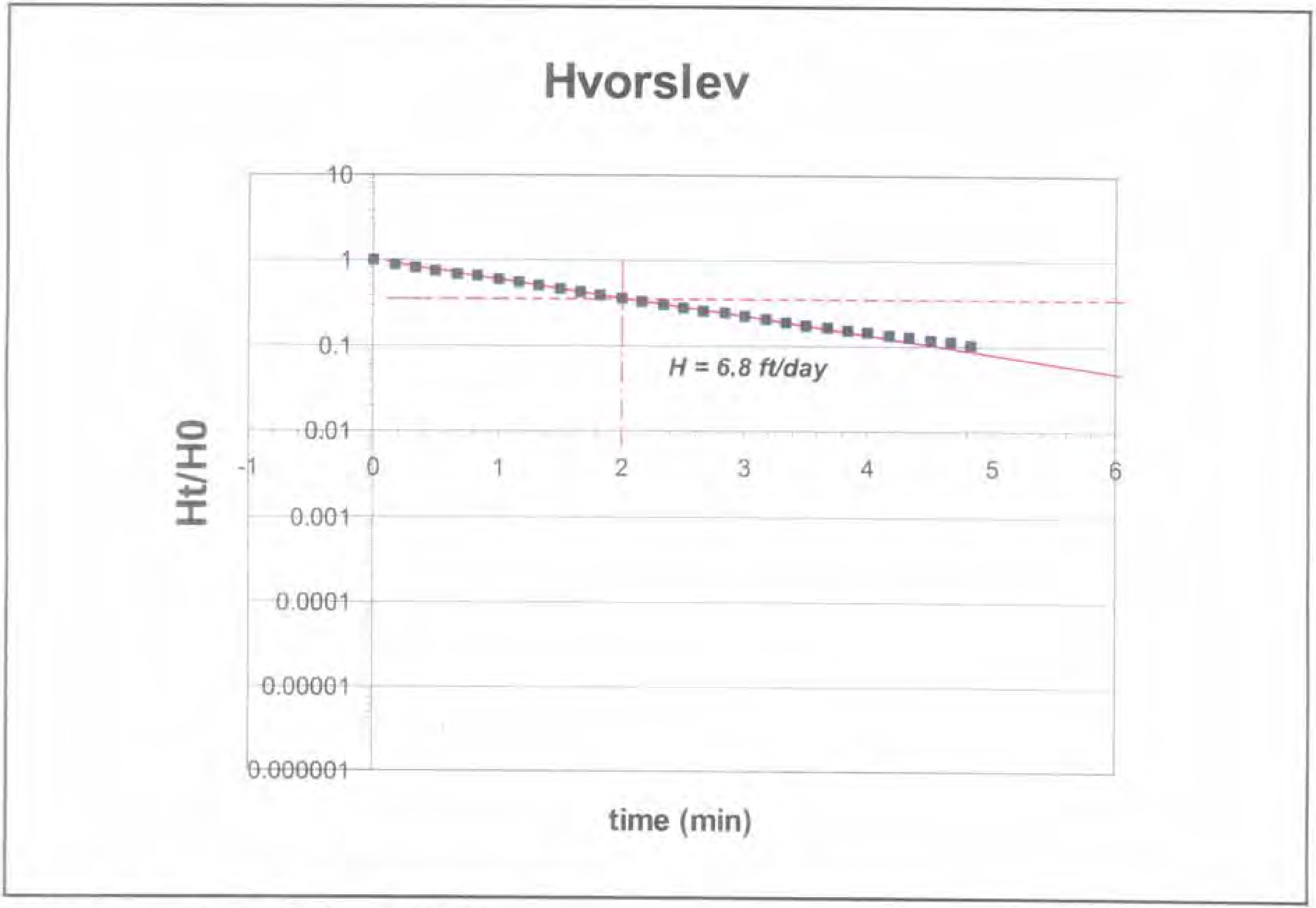

FIGURE 5-4. Well 13 slug test, Hvorslev Analysis.

higher hydraulic conductivity, ranging from 32 to 64 ft/day, which is likely representative of the aquifer below a depth of 30 feet. The tidal water level fluctuations in wells 1, 8, and 9 indicate that the base of these wells was closer to a zone of higher hydraulic conductivity (**Table 5-2**). The low tidal efficiencies of wells 13 and 11 at 54 and 36 percent, respectively are consistent with the low hydraulic conductivity values determined in the slug test data. However, wells 8, 9, and 1 all had high tidal efficiencies ranging between 87 and 89 percent. It is estimated that the depth to the 100 ft/day hydraulic conductivity values is not 30 feet as found on Andros Island, but at about 50 feet at this location. Although well 1 did penetrate the aquifer to a depth of about 52 feet, it did not respond as to a higher hydraulic conductivity condition at that location based on the test data that is confirmed by the tidal water level fluctuations.

The tidal fluctuation data were analyzed using the sinusoidal head fluctuation method of Ferris (1951) as given in Ferris et al. (1962). This method is used primarily for well-confined aquifers that show a consistent response to a pressure change at the point or region of sub-sea outcrop to the location of the monitoring well. Because of the variation of hydraulic conductivity of the aquifer and the penetration depth of the wells, the hydraulic conductivity data derived from this methodology are questionable at best. Wells 8, 9, and 1 were in the middle of the well alignment and the analysis would yield a hydraulic conductivity of over 2 million ft/day for these wells. This is not a reasonable value and the high tidal efficiencies are believed to be the result of vertical pressure changes in the underlying rocks, which have an extremely high hydraulic conductivity. These wells may lie near a vertical hydraulic conduit that would allow the transmission of pressure through the entire thickness of the aquifer. Also, the method of Ferris (1951) and Ferris et al. (1962) is better suited to the analysis of well-confined aquifers rather than unconfined or semi-unconfined aquifers.

Based on the hydraulic conductivity data collected from the Albany House site and the data collected on Andres Island, a hydraulic conductivity profile for the Lucayan Limestone aquifer was estimated for this location (**Figure 5-5**). The geological information collected from the test drilling showed that the lithology of the Lucayan Limestone was quite consistent from land surface to a depth of 50 feet. The lithology is a slightly-cemented, marine, oolitic limestone containing a series of calcretes which are well-cemented. The hydraulic conductivity ranges from 5 to 10 ft/day to a depth of about 35 feet below surface and increases to the 100 ft/day value at about 60 feet below surface. It is likely that the hydraulic conductivity increases substantially below 60 feet to values at or over 1000 ft/day. There are areas where the lower range of hydraulic conductivity values occurs to a greater depth. These locations may be depressions within the limestone surface which formed during a given sea level event or were channels that were later infilled with marine oolites.

5.4.4 Potentiometric Surface and Land Surface Topography

A topographic map of the site was obtained from Turrell & Associates, Inc. (**Figure 5-6**). The topography shows a typical depositional pattern of a marine oolite, similar to those on the margin of the Great Bahama Bank, with an aeolian dune deposit in the northwest

Table 5-2. Analysis of Tidal Fluctuation Data from Monitoring Wells (5/7/05)

Predicted tidal data, high and low at the Nassau, new Providence Island gaging station

Time (EDT) for May 7, 2005	High Tide (ft., NGVD)	Low Tide (ft.,NGVD)
13:58		+0.45
20:24	+3.80	

Total tidal range = 3.35 feet

Well No.	Time of High Tide (EDT)	Time of Low Tide (EDT)
13	20:50:53 (1st)	14:13:33
8	21:00:01 (1st)	14:13:01
9	21:00:13	14:13:13
1	21:00:01	14:10:21
11	21:40:03	14:54:23

Well No.	High Reading (feet)	Low Reading (feet)	Range (feet)
13	-5.634	-3.831	1.803
8	-12.622	-9.654	2.968
9	-15.141	-12.233	2.918
1	-18.654	-15.681	2.973
11	-12.224	-11.012	1.212

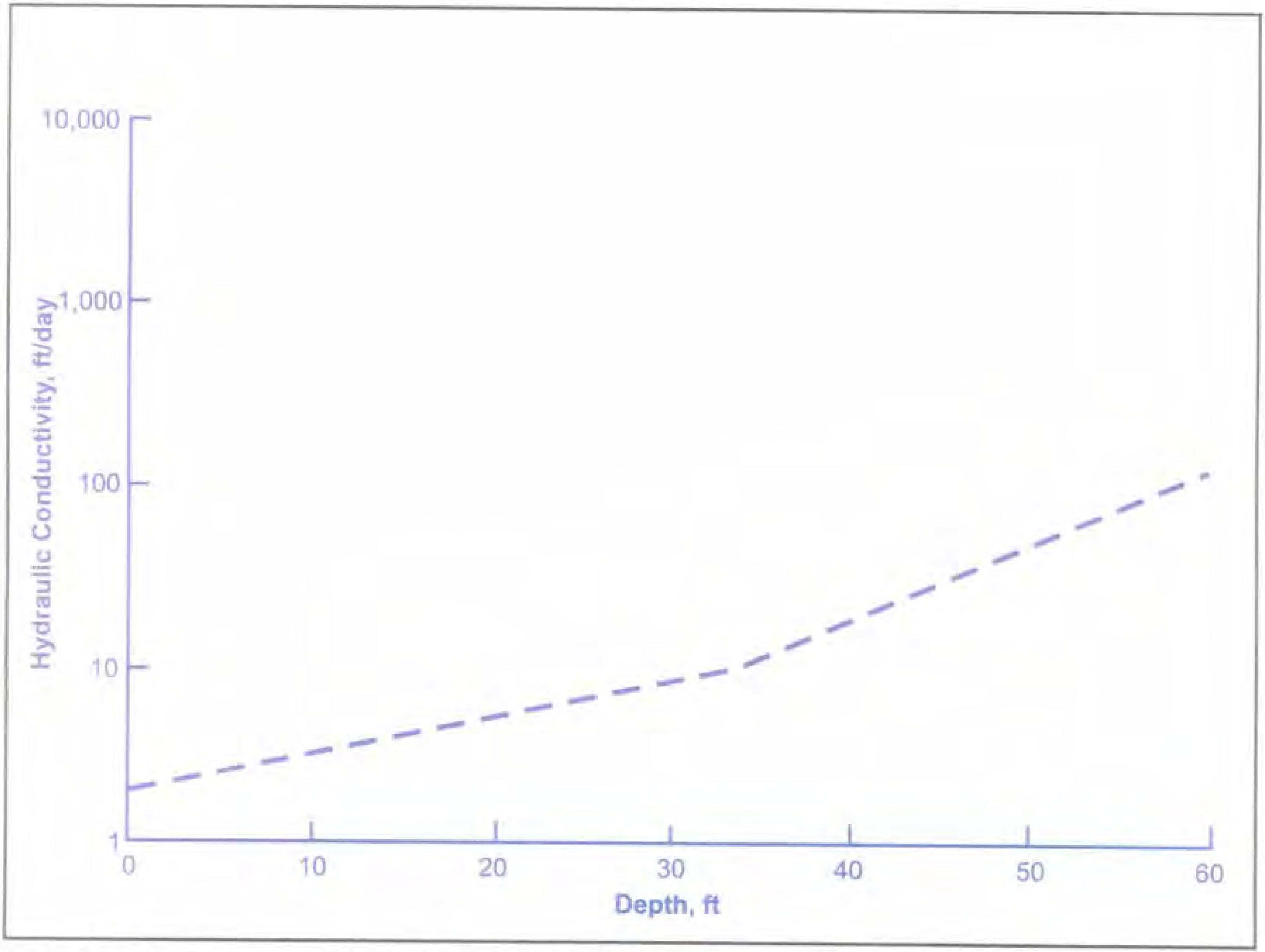

FIGURE 5-5. Estimated hydraulic conductivity with depth in the Lucayan Limestone Aquifer beneath the site.

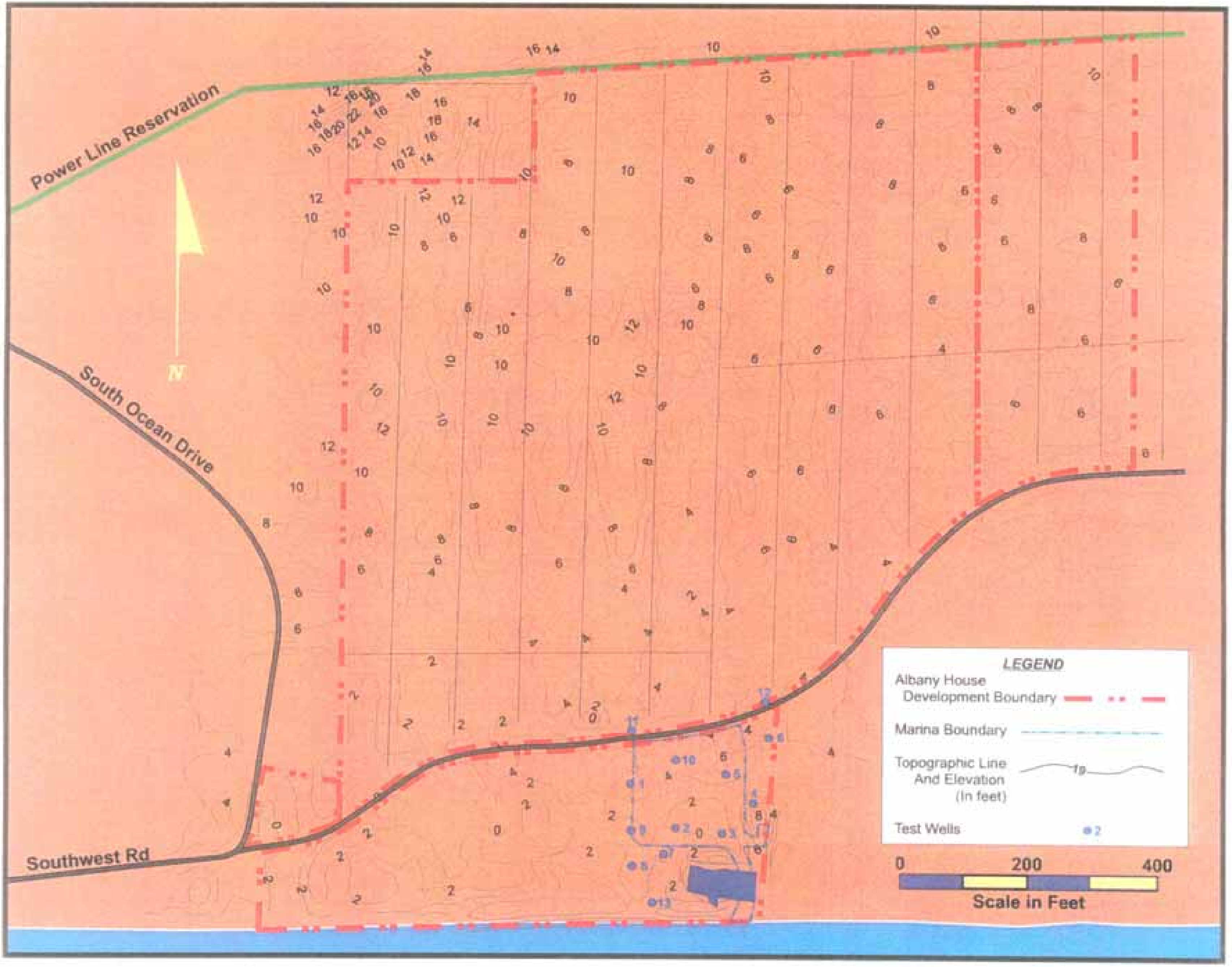

FIGURE 5-6. Map showing the site topography, the marina boundary, and the location of monitoring wells.

part of the property. The uneven land surface slopes from an average value of about 10 feet in the north and central parts of the site to sea level at the south along the shoreline. The slope of land surface is about 0.007.

The slope of the potentiometric surface (water table) on an oceanic island subject to differential changes in the potentiometric surface caused by tidal fluctuations is quite problematical. Measuring points (top of casings) were leveled to NGVD by a surveyor on wells 11, 1, 8, 9, and 13. Various scenarios for monitoring of these water levels were made to assess the approximate hydraulic slope through this section. Unfortunately, the tidal fluctuations of water levels and well depths were not consistent, so the data are somewhat questionable. Based on estimated water levels in the wells corrected for salinity, the estimated potentiometric surface slope across the marina site is about 0.004.

Another method of determining the slope of the water table is to use the pre-development salinity data (next section) and apply a Ghyben-Herzberg approximation. The thickest occurrence of freshwater on the southern part of the project site was about 36 feet from well 2 to the shoreline (maximum gradient). If it is assumed that the distance to the southern boundary of the freshwater plume with a depth of 36 feet is about 150 feet and the approximate position of the potentiometric surface above NGVD is about 0.9-foot based on the 36-foot thickness of freshwater, then the slope across the marina site is roughly 0.006. Since there is considerable variation in water quality in the southern part of the site, the hydraulic slope as corrected for temperature and salinity will vary considerably. It is likely that the regional gradient is slightly less than the estimate made using the salinity of the closest well containing freshwater to the shoreline. An average slope of the potentiometric of about 0.005 is a reasonable estimate.

Section 6
Groundwater Quality

6.1 Past Investigations

Beginning in the 1960s, a series of monitoring wells were installed on New Providence Island to assess the thickness of the freshwater lens on the island (Little et al., 1977). Hydrogeologic investigations conducted in the early 1970s showed that the freshwater covered an area of about 7083 hectares of the island, which has an area of about 20,719 hectares (Cant and Weech, 1986). The geometry of the freshwater lens on New Providence Island is controlled greatly by the local geology, relief, and the presence of tidal surface water bodies on the island. A map showing the thickness of the freshwater lens beneath the western part of the island measured in the early 1970s is given in **Figure 6-1**. Freshwater in this map was defined as water containing a dissolved chloride concentration of 400 mg/l or less following the definition contained in Cant and Weech (1986). This map shows that the greatest thickness of fresh groundwater occurs beneath topographic high areas, especially on the western and northern parts of the island. This lens has been altered by the activities of man on the island since it was first measured nearly 30 years ago. The construction of tidal channels, manmade lakes, and the withdrawal of freshwater via shallow trenches and pits has either eliminated freshwater or reduced the thickness of the lens in many areas of the island. Today, site-specific information is required to assess the potential impacts of development activities.

6.2 Monitoring Well Water Quality Data

A series of 25 monitoring wells were drilled on the Albany House development site to assess the water quality in the Lucayan Limestone Aquifer. Thirteen of the monitoring wells were drilled in the marina area (numbers 1 to 13) and 12 additional wells were drilled north of the road in the current waterfields area (numbers 1N to 12N). The global positioning coordinates for the monitoring wells are given in **Table 6-1**. Also, an electromagnetic geophysical investigation was conducted to assess the vertical transition from freshwater to seawater within the aquifer. The complete data from these wells is contained in **Appendix B** of this report.

The salinity of the water beneath the Albany House development site has changed over the past 30 years. The term salinity used in this report is the same as total dissolved solids. A salinity of 500 mg/l or 0.5 parts per thousand is used as the upper limit of freshwater. Based on the 500 mg/l limit of freshwater and assuming the groundwater to be similar in chemistry to dilute seawater, the equivalent dissolved chloride concentration would be about 270 mg/l. The original thickness of freshwater beneath the site based on a 400 mg/l upper limit for dissolved chlorides (Cant and Weech, 1987) is shown in **Figure 6-2**. The construction of a lake (proposed marina basin) reduced the quantity of freshwater south of Adelaide Road and other activities changed the original pattern of salinity occurrence in the aquifer. Maps showing the locations of monitoring wells in the NPDC water fields and extended lands and near the marina site are given in **Figures 6-3**

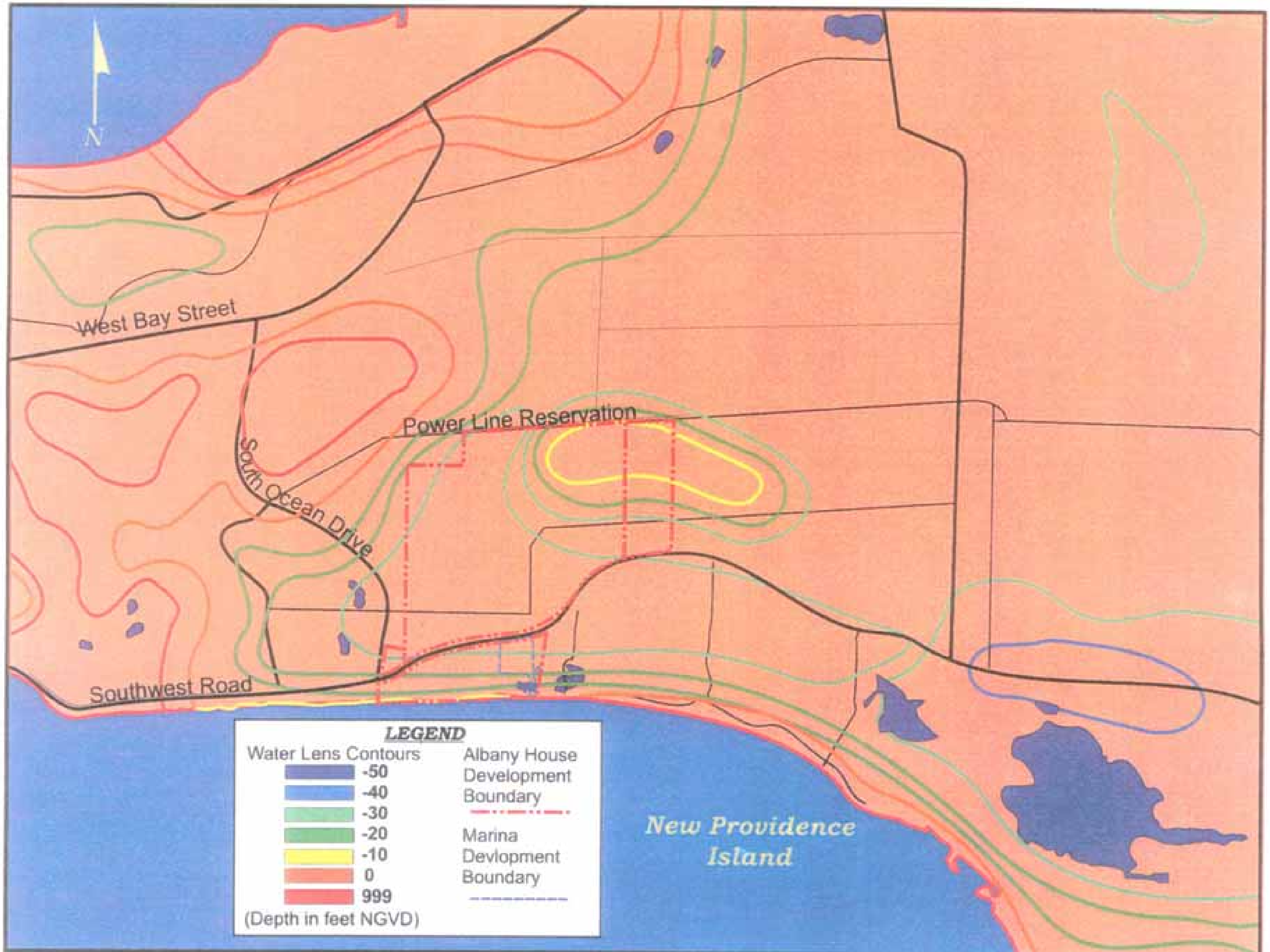

FIGURE 6-1. Thickness of the freshwater lens beneath New Providence Island in the late 1970's (from Richard Cant).

Table 6-1. Global Positioning Coordinates for Monitoring Wells

Well #	GPS Locations			
	WGS84		UTM NAD27	
Albany Marina				
1	25°00.237N	77°30.492W	18 246 822E	27 67529N
2	25°00.184N	77°30.440W	18 246 907E	27 67428N
3	25°00.184N	77°30.384W	18 247 002E	27 67424N
4	25°00.218N	77°30.349W	18 247 062E	27 67485N
5	25°00.259N	77°30.388W	18 246 997E	27 67564N
6	25°00.282N	77°30.336W	18 247 085E	27 67604N
7	25°00.161N	77°30.448W	18 246 892E	27 67384N
8	25°00.148N	77°30.485W	18 246 829E	27 67362N
9	25°00.186N	77°30.494W	18 246 818E	27 67432N
10	25°00.248N	77°30.446W	18 246 899E	27 67546N
11	25°00.297N	77°30.491W	18 246 825E	27 67636N
12	25°00.322N	77°30.330W	18 247 097E	27 67679N
13	25°00.124N	77°30.460W	18 246 871E	27 67319N
NPDC				
1	25°02.959N	77°29.298W	18 248 992E	27 72517N
2	25°02.725N	77°29.052W	18 249 328E	27 72077N
3	25°01.701N	77°28.877W	18 249 588E	27 70177N
4	25°01.112N	77°28.876W	18 249 569E	27 69092N
5	25°00.547N	77°29.723W	18 248 126E	27 68076N
6	25°00.234N	77°30.773W	18 246 349E	27 67529N
7	25°00.920N	77°30.612W	18 246 643E	27 68792N
8	25°00.994N	77°29.745W	18 248 102E	27 68896N
9	25°01.615N	77°29.843W	18 247 961E	27 70051N
10	25°01.612N	77°30.237W	18 247 296E	27 70054N
11	25°00.519N	77°28.875W	18 249 552E	27 67999N
12	25°02.062N	77°29.775W	18 248 090E	27 70869N

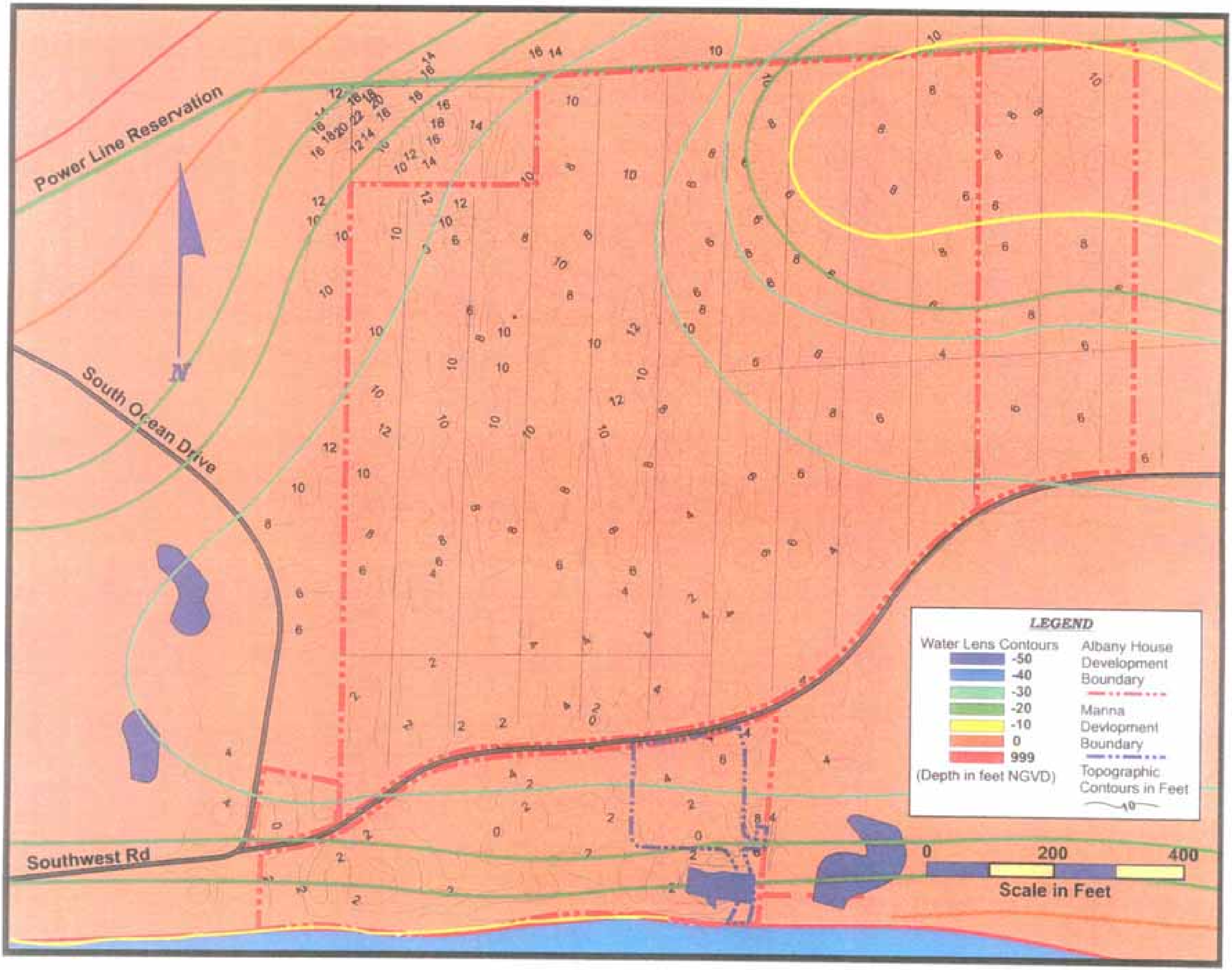

FIGURE 6-2. Thickness of the freshwater lens beneath the development site in the late 1970's (from Richard Cant).

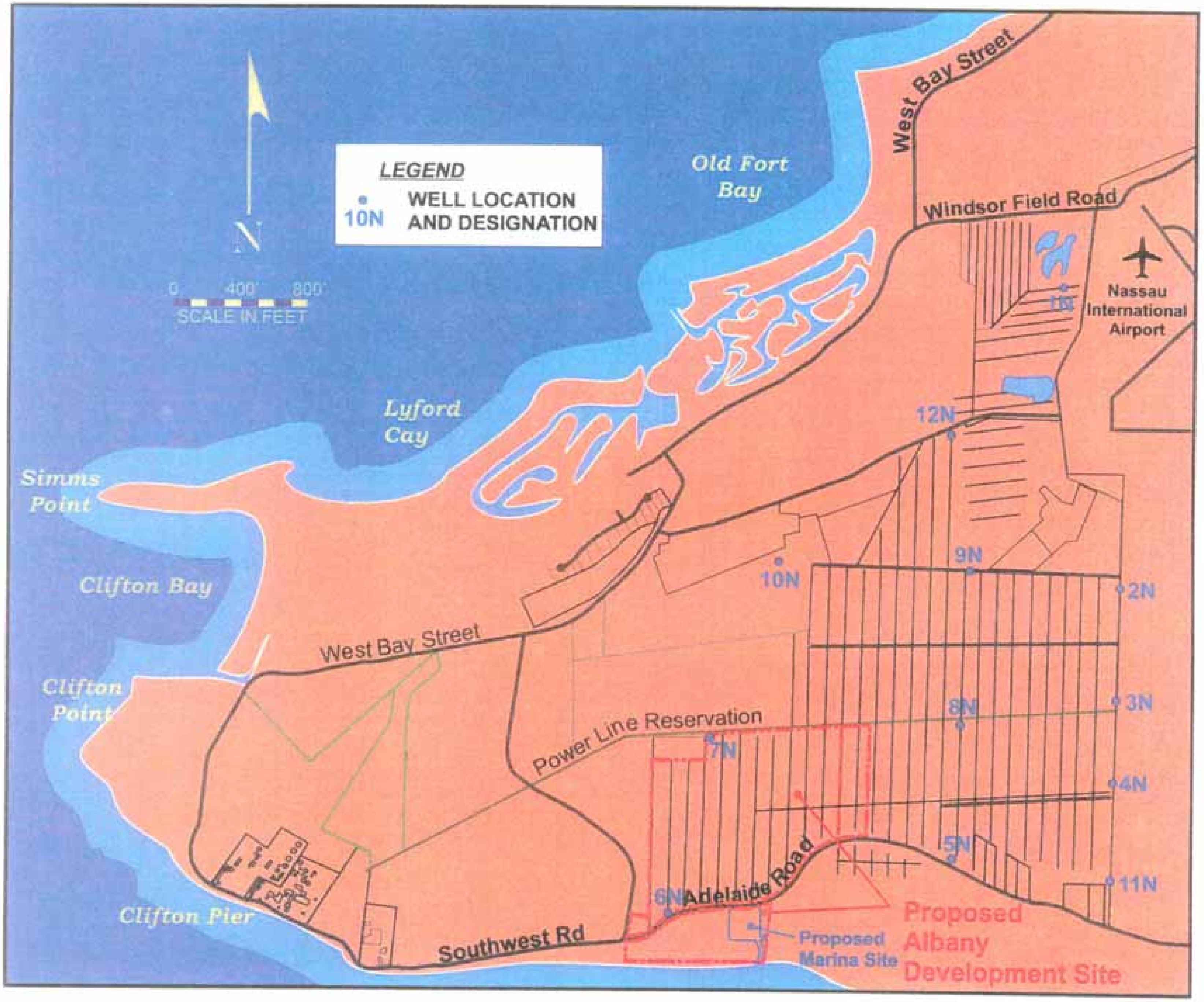

FIGURE 6-3. Map showing locations of NPDC monitoring wells.

and **6-4**. The dissolved solids concentration at the top of the aquifer in the monitoring wells for the NPDC lands is given in **Figure 6-5**. A more detailed view of the dissolved solids concentration at the top of the aquifer near the proposed marina site is shown in **Figure 6-6**. The area containing freshwater with a dissolved solids concentration of 500 mg/l or less is shown on the graphic. The area of emphasis is the southern part of the development in and around the site proposed for the marina. North of the road, the salinity in the aquifer is relativity low and there is a significant quantity of freshwater stored in the aquifer. Note however that there are some brackish water occurrences within the water fields caused by overpumping in some of the trenches. South of the road at the proposed marina site, the area of the aquifer containing freshwater is limited to lands located away from the shoreline and the manmade lake. Most of the proposed marina basin area currently does contain freshwater. The proximity to the sea and the existence of an old excavation limit the amount of freshwater on the southernmost part of the property.

The thickness of freshwater beneath the site was mapped using all of the monitoring well data (**Figures 6-7 and 6-8**) and ranges from zero to approximately 36 feet beneath the development site. In the area south of the road within the marina site, the measured thickness of freshwater is up 36 feet (measured) with the possibility of a greater thickness in the northern area (**Figure 6-8**). The south area containing over 30 feet or greater of freshwater is nearly surrounded by poorer quality water containing a higher salinity. The excavation located in the southeastern corner of the property contains water with a dissolved chloride concentration of 1600 mg/l. Lakes located on the property to the east of the site have dissolved solids concentrations between 1500 and 2200 mg/l.

6.3 Electromagnetic Survey Results and Profile of Salinity Changes with Depth

An electromagnetic (EM) survey was conducted on the site to assess the variation of water quality with depth and the overall geometry of the freshwater lens. The purpose of conducting the EM survey was to test the method for mapping the thickness of the freshwater lens and to obtain the depth to the top of normal seawater, which has a dissolved solids concentration of 35,000 mg/l. The EM method has been successfully utilized in the past for these purposes in the Bahamas (Hall, 1992; 1995).

The EM survey was conducted by making a series of "soundings" using a Geonics Limited instrument. The instrument uses coils or loops of wire through which an electric current is passed to create a magnetic field. Soundings are made at land surface at a series of points. Key factors that influence the results of an EM survey are: 1) porosity, 2) pore fluid conductivity, 3) degree of saturation, 4) temperature, and 5) pore surface area. The pore fluid conductivity and the pore surface area are the two significant factors influencing the ground conductivity. These factors were structured to yield a layered-earth model that included an unsaturated layer, a freshwater layer, a brackish-water layer, and an infinitely-thick seawater layer.

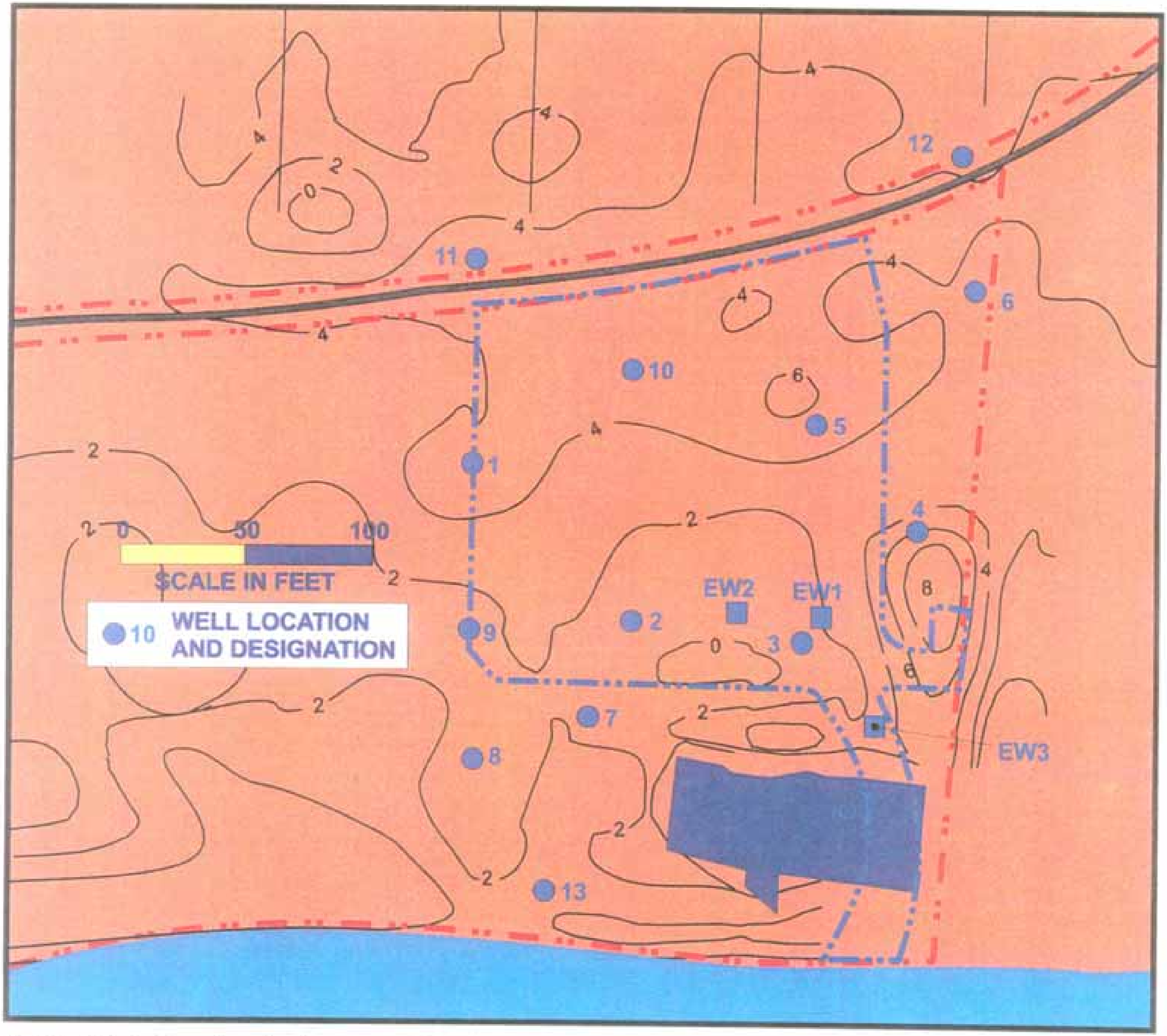

FIGURE 6-4. Map showing locations of the Albany monitoring wells.

FIGURE 6-5. Map showing NPDC well locations and total dissolved solids concentrations at the top of the aquifer.

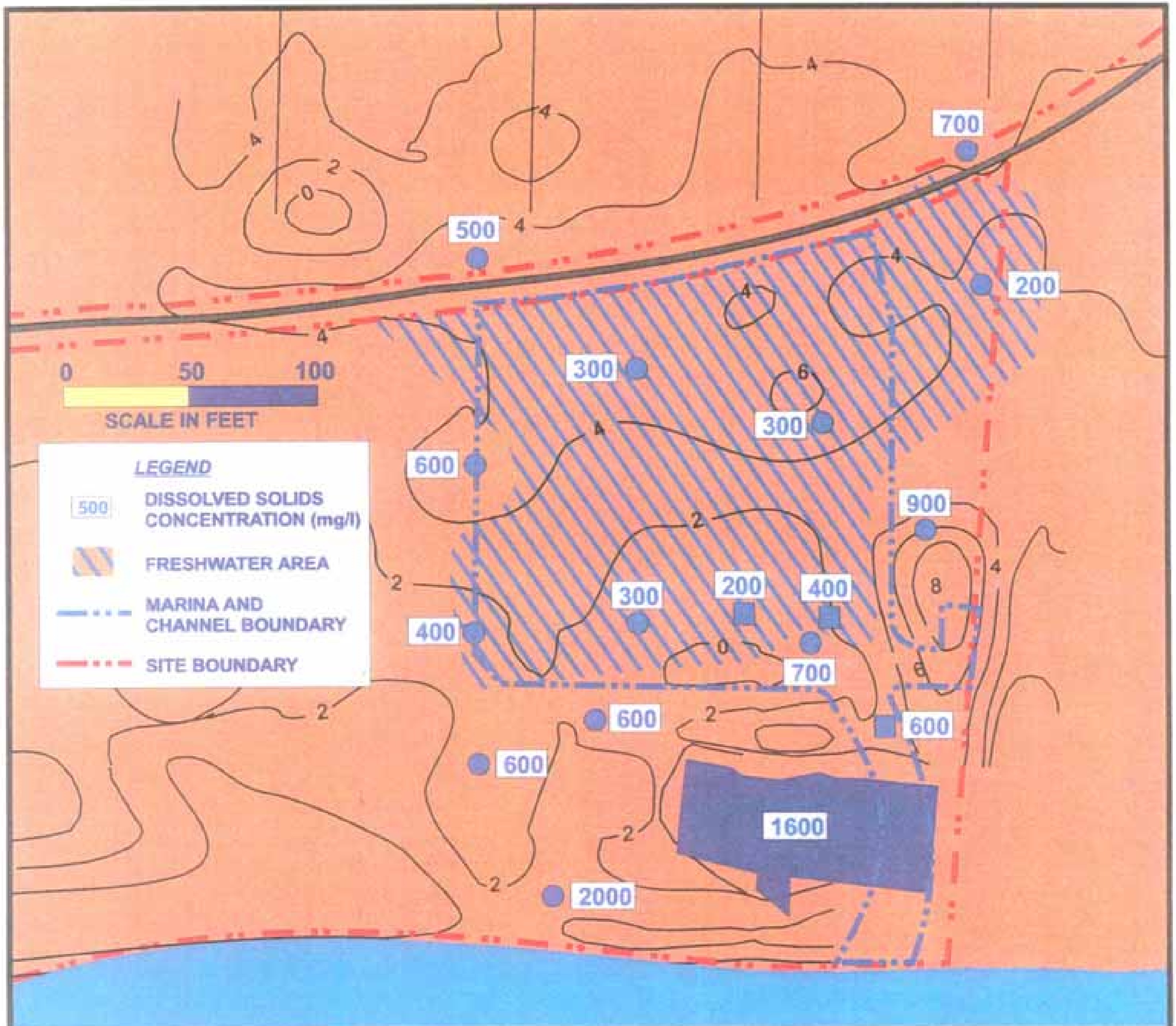

FIGURE 6-6. Map showing the dissolved solids concentration at the top of the aquifer in the vicinity of the proposed marina.

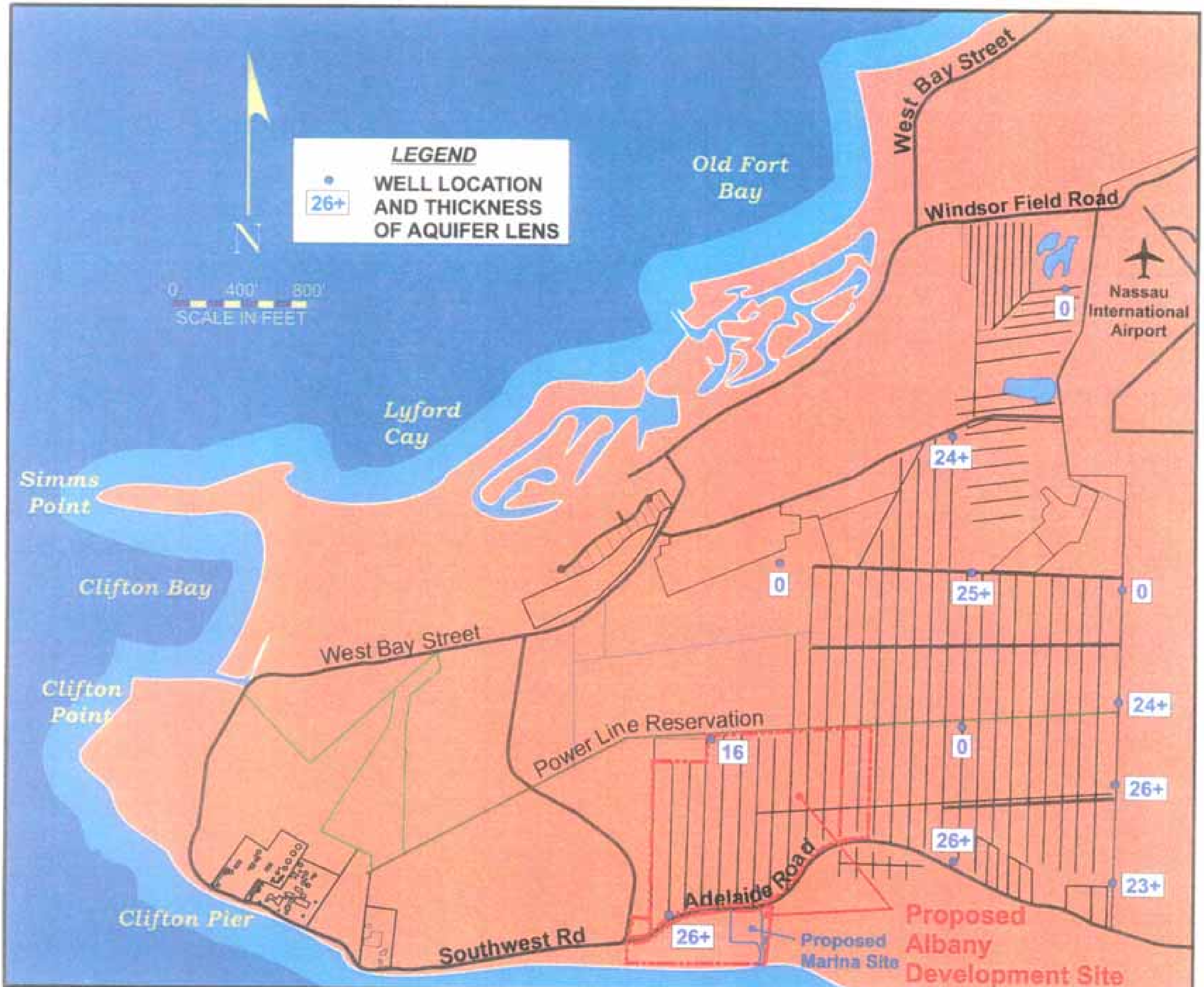

FIGURE 6-7. Map showing the thickness of the freshwater lens in the NPDC monitoring wells. (Freshwater is less than 500 mg/l of dissolved solids)

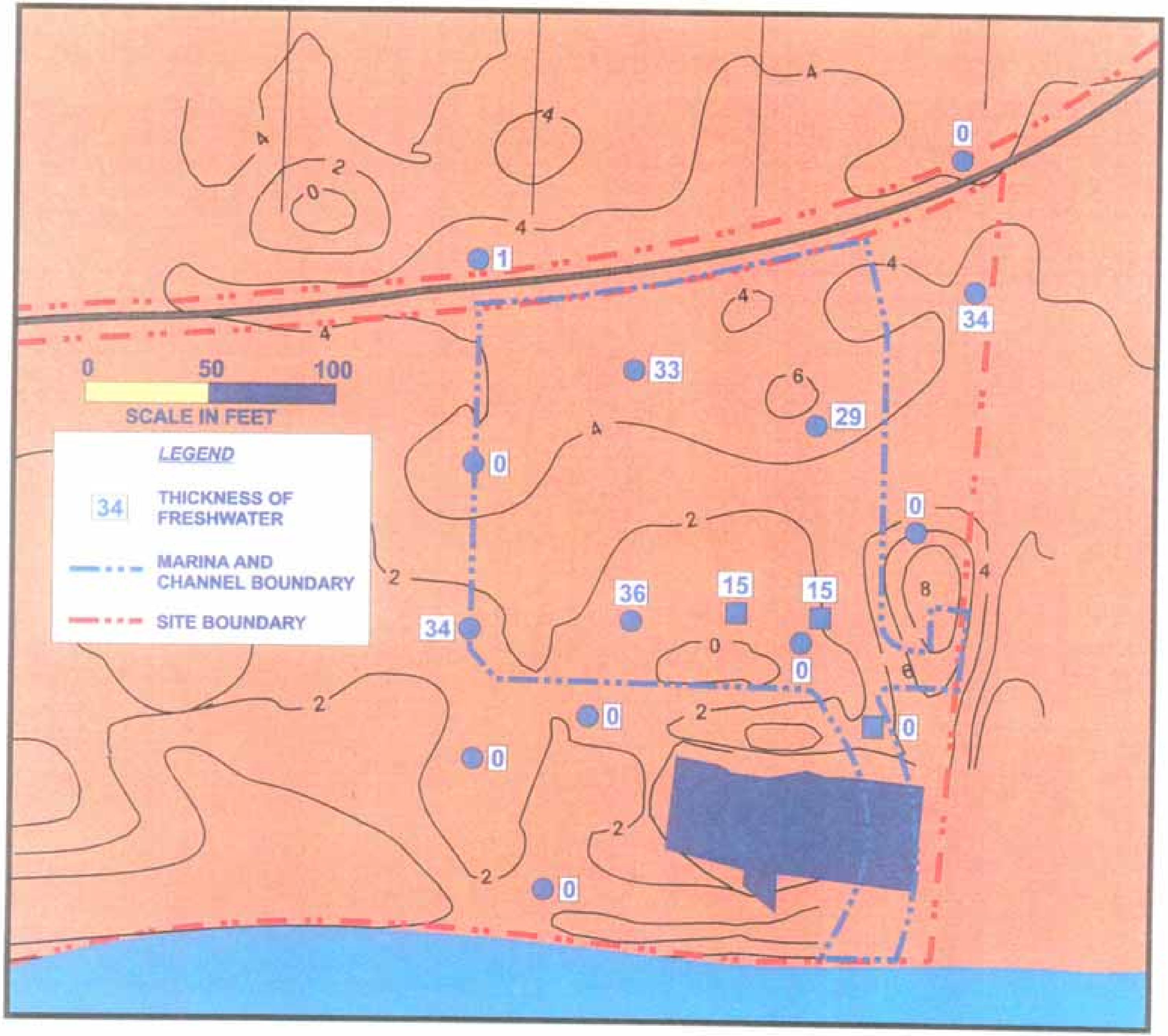

FIGURE 6-8. Map showing thickness of freshwater at the Albany House Development south of Adelaide Road. (Freshwater is less than 500 mg/l of dissolved solids)

Five locations for soundings were made, which included: 1) the Albany House location. 2) the north quadrant of the NPDC water fields, 3) the south quadrant of the NPDC water fields, 4) the east quadrant of the NPDC water fields, and 5) the west quadrant of the NPDC water fields. Soundings data for each location were placed into an electromagnetic model for analysis.

The depth to the brackish-water/seawater interface was an important variable determined. Results of the modeling are given in **Table 6-2**. Note that the depth to seawater ranges from 53 to 63 feet below surface.

Table 6-2. Depth to Seawater Interface Using the Electromagnetic Method

Location	Depth to Seawater Interface (feet below surface)
1) Albany House	63
2) North quadrant NPDC Water Field	54
3) South quadrant NPDC Water Field	58
4) East quadrant NPDC Water Field	56
5) West quadrant NPDC Water Field	53

Section 7
Groundwater Model

7.1 Introduction

In order to assess the impacts of the marina development, a groundwater model was constructed. The model covered an area of about 6000 feet in an east-west direction and 5400 feet in a north-south direction or an area of about 745 acres, which is greater than the area of the development site (**Figure 7-1**). This modeling was performed by Waterloo Hydrogeologic, Inc. (a Schlumberger Company) under a subcontract agreement to HallTech and Missimer Groundwater Science, Inc. The entire text of the modeling report is given in **Appendix C**.

A numerical solute transport model of the Lucayan Limestone Aquifer was constructed for the development area for the specific purpose of assessing the impacts of the marina basin on the freshwater lens. The code used for the modeling effort was FEFLOW (WASY, 2003), which is a finite element model. The FEFLOW model utilizes a series of variably spaced triangles into which data is entered in three dimensions (**Figure 7-2**).

Groundwater models are tools that allow the structured use of complex hydrogeologic data, including water levels, aquifer hydraulic characteristics, lithology, water quality, and a variety of other properties, to simulate existing conditions and to project new conditions based on posed questions. The model developed was calibrated to the conditions measured in the field on-site and in other areas of New Providence Island. The data input was developed from the information presented in Sections 4 to 6 of this report. The flow field of the model and the water quality information were calibrated to actual observations to enhance the accuracy of the model. However, a model is only as good as the data that were placed into it and the hydrogeology of the site does have some natural variations that may not have been fully measured during the field investigations. Therefore, the model is a general guide to how the hydrologic system operates and decisions using the model should be based on both the results of the modeling and on the errors involved in the modeling process. It is best to be conservative when assessing resource impacts and planning resource development.

7.2 Modeling Results

The groundwater model was used to develop a series of cross-sectional and block views of the aquifer system through the marina site. A pre-development block section from north to south (right to left) is given in **Figure 7-3**. The colors in the diagram show the water quality from freshwater at the top of the aquifer (blue) to seawater (red) at the base of the freshwater lens. The southern edge of the model shows the intersection of the freshwater lens with the Atlantic Ocean. Flow of freshwater through the aquifer moves from north to south and discharge occurs along the interface shown at the far left of the figure. Upon completion of the marina basin, the conditions in the aquifer change and are

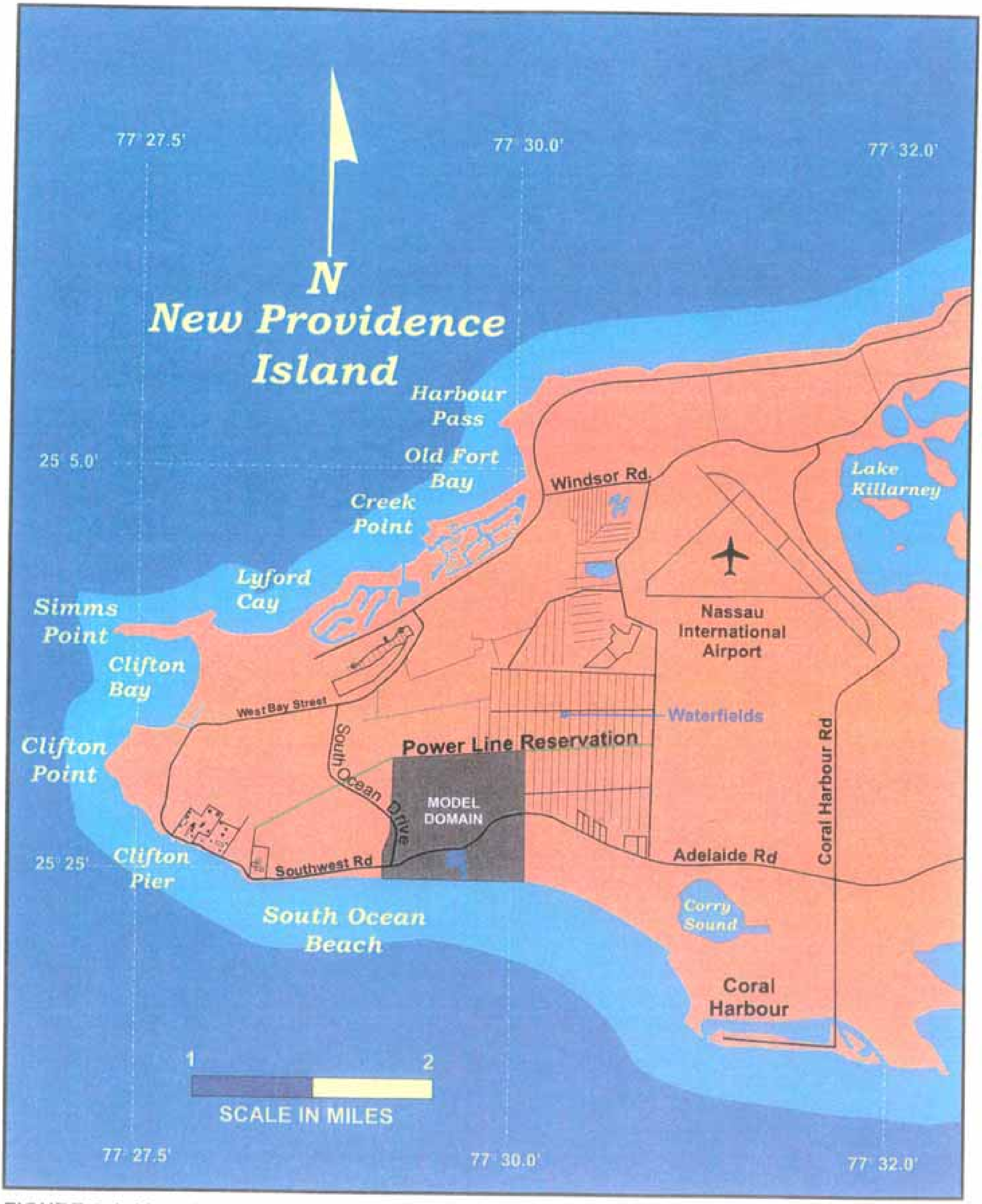

FIGURE 7-1. Map showing location of Model Domain.

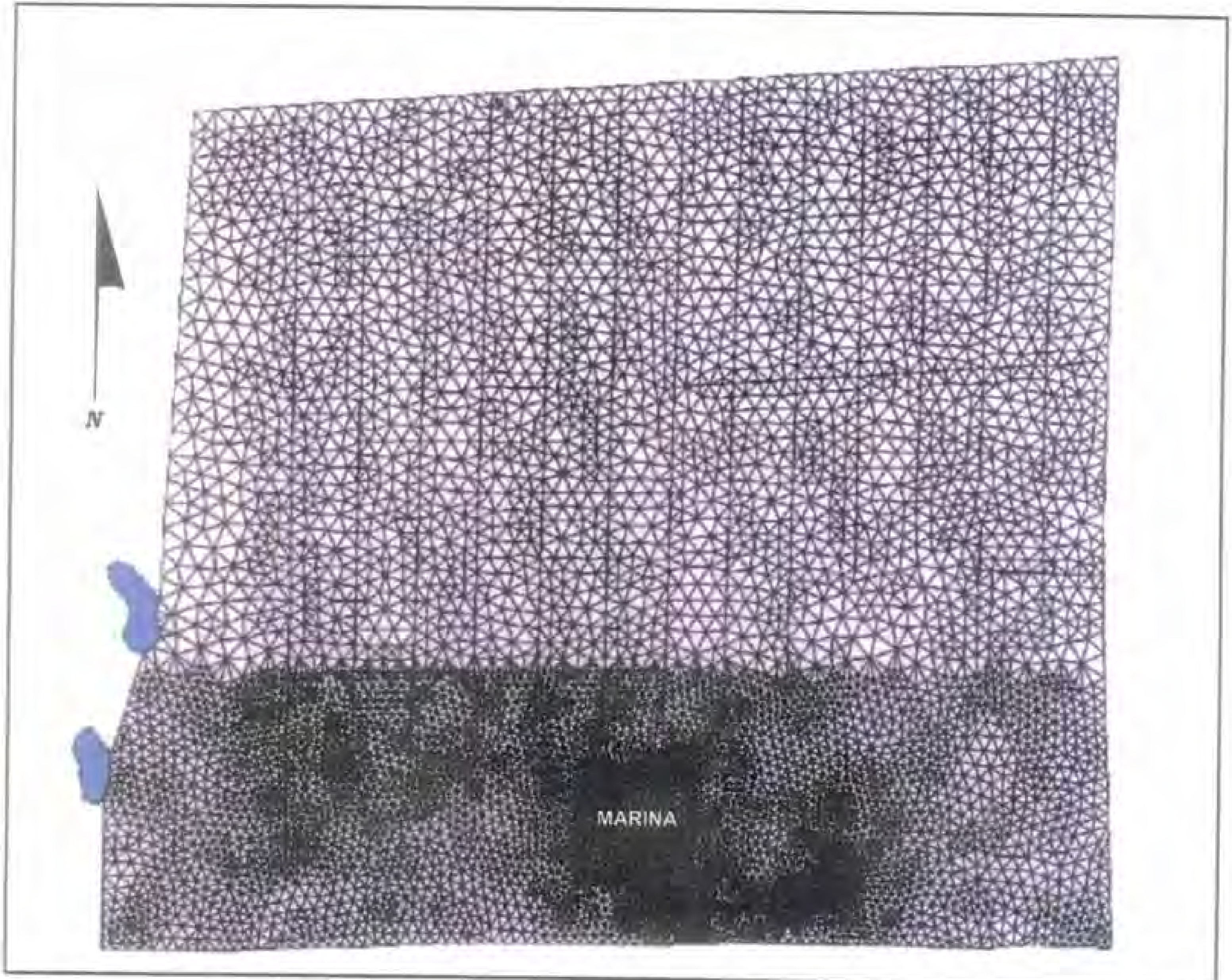

FIGURE 7-2. Model area with Albany Marina.

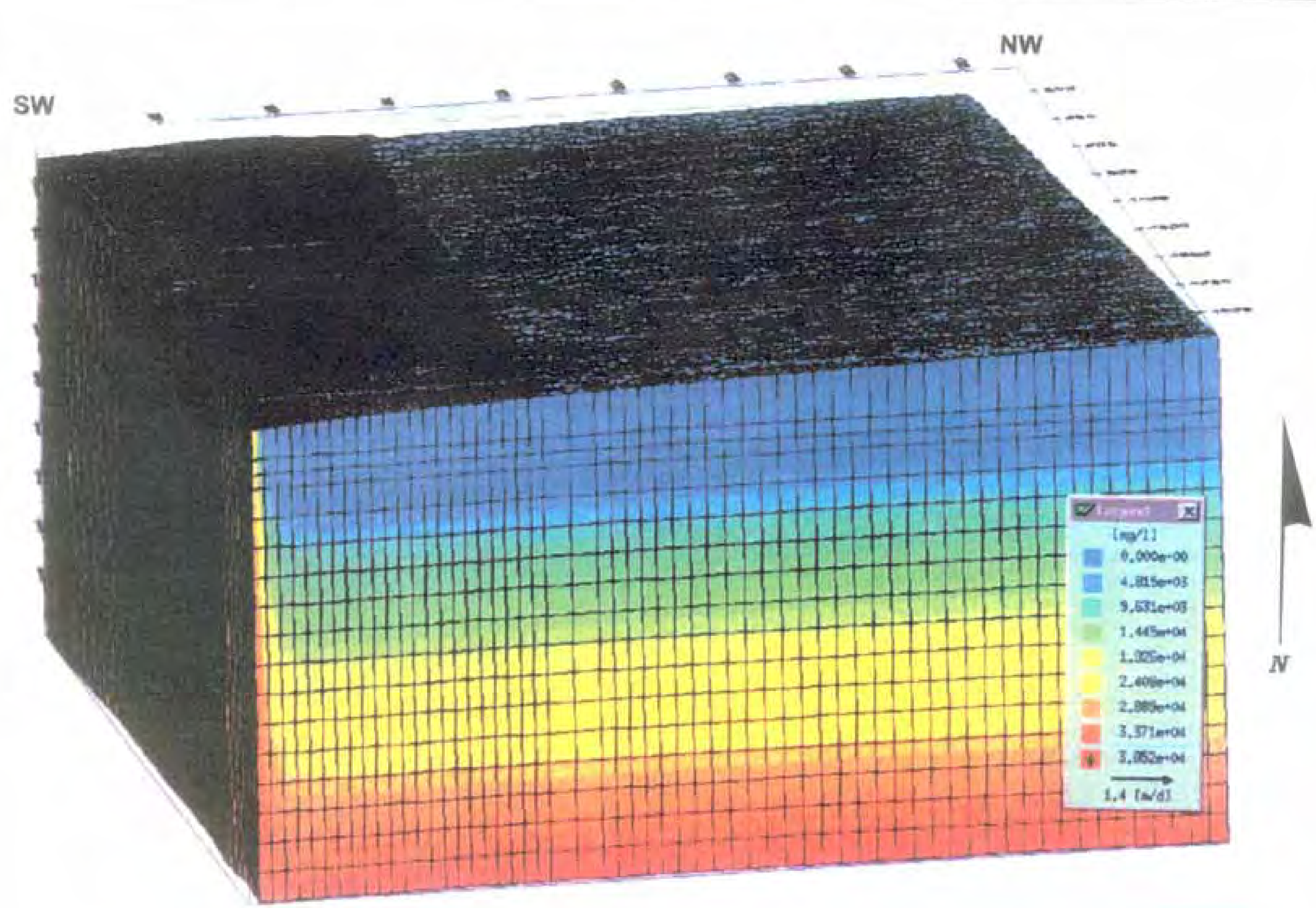

FIGURE 7-3. Distribution of dissolved solids concentrations in mg/l (body without Albany Marina).

shown in **Figure 7-4**. This is a north to south (right to left) cross-sectional view of the water quality in the aquifer after marina construction. The impacts of the marina are clearly shown, where the high salinity water has replaced the freshwater in the area directly below the marina (red and yellow to top). Note that there still will be some freshwater in the lens trapped between the marina basin and the ocean. This is representative of the areas away from the access channel. A three-dimensional view of the marina in the context of the freshwater lens is shown in **Figure 7-5**. Note that the impacts of the marina are more vertical than horizontal. A plan view of the marina basin with a smaller-scale is shown in **Figure 7-6**. This is a slice through the aquifer in the middle of the freshwater lens. It shows the impacts of the saline-water through the full thickness of the aquifer. The light green and yellow colors outside of the margins of the marina basin denote the movement of saline-water beyond the basin boundaries. The estimated influence of the marina basin based on the modeling is less than 300 feet to the north and the same on the eastern and western sides. The effects are minor.

The modeling results show that the primary impacts of the marina are localized to the area beneath the marina basin and saline-water does not encroach very far into the remaining part of the property. There are however some additional impacts. The drainage of freshwater into the marina basin will be enhanced and will be at a greater rate than at the natural interface located near the shoreline. This is caused by the creation of greater than natural hydraulic gradients at the margins of the marina basin during tide changes.

Although the modeling results show the impacts are relatively minor within the context of the overall property and the island, the model is based on the data collected in the field from the site and other locations on the island. The hydraulic conductivity of the aquifer was found to be relatively low in the upper 20 feet of the aquifer. If the assumption of this low value is not correct at the margins of the marina basin, the impacts could be significantly greater. Therefore, a simulation was conducted on the aquifer near the marina to assess the impacts of constructing a curtain wall to stop discharge of freshwater into the marina in the horizontal plane. A curtain wall is a barrier placed in the ground to stop the flow of groundwater. It can be constructed of cement sheet-piling, steel sheet-piling, or trenches can be constructed and infilled with cement and/or bentonite (clay) (see Section 8).

The modeling results for the curtain wall showed that the flows into the basin via the groundwater system would be significantly reduced (at least 25%). Also, the aquifer would be afforded more protection in the event that the model input for hydraulic conductivity was too low at this location.

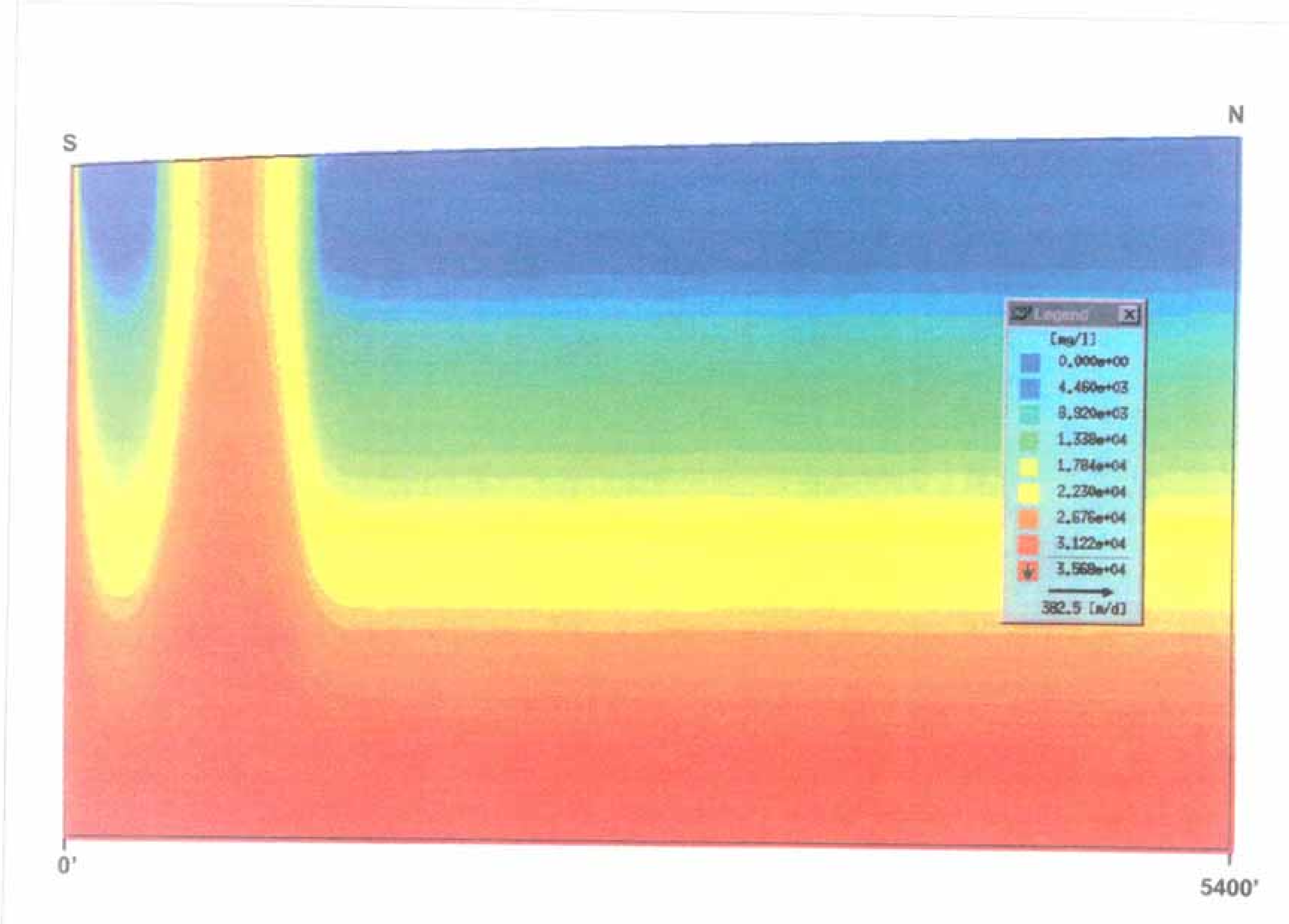

FIGURE 7-4. Distribution of dissolved solids concentrations in mg/l (with Albany Marina, fringes, segment 1).

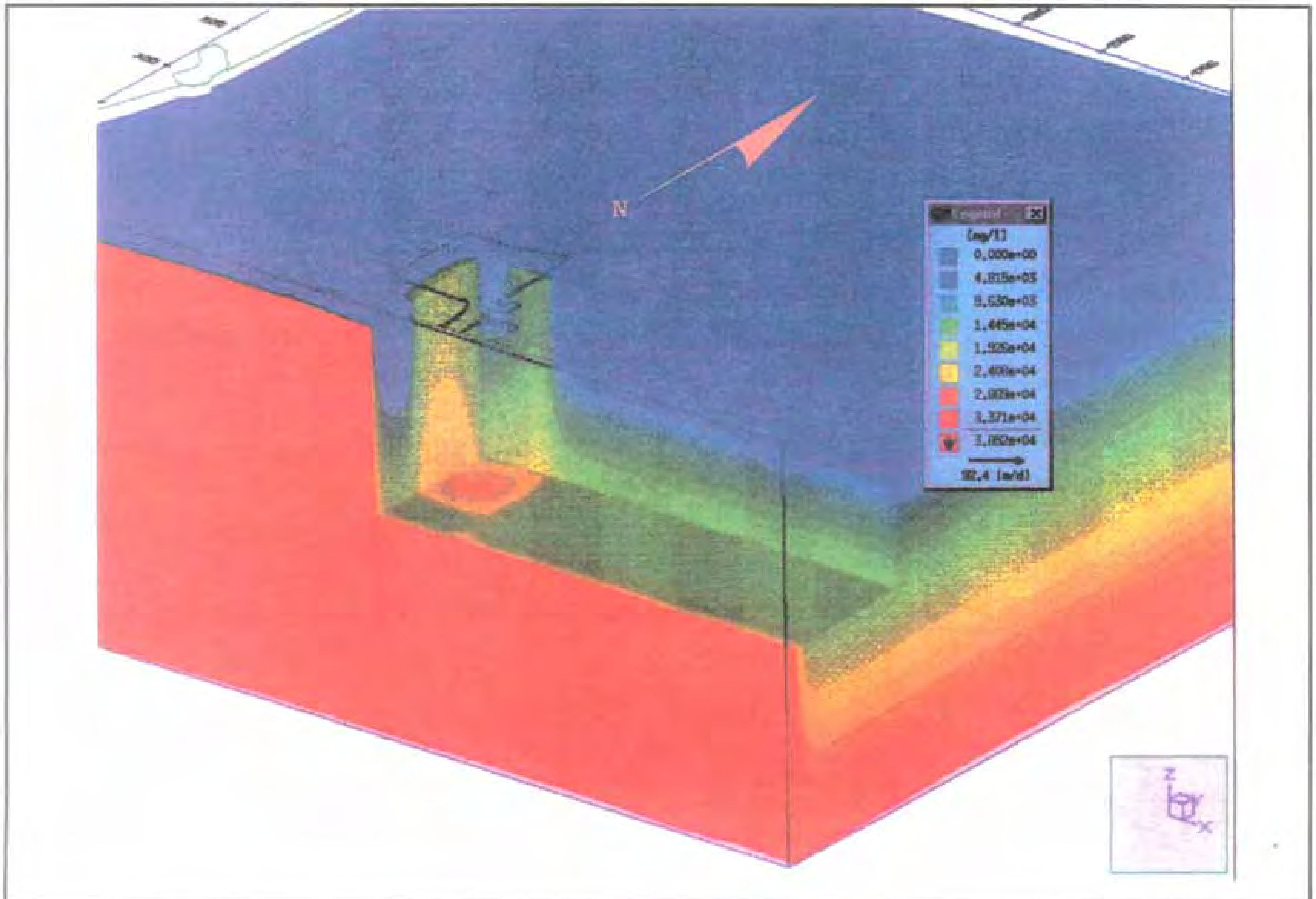

FIGURE 7-5. Distribution of dissolved solids concentrations in mg/l (body with Albany Marina).

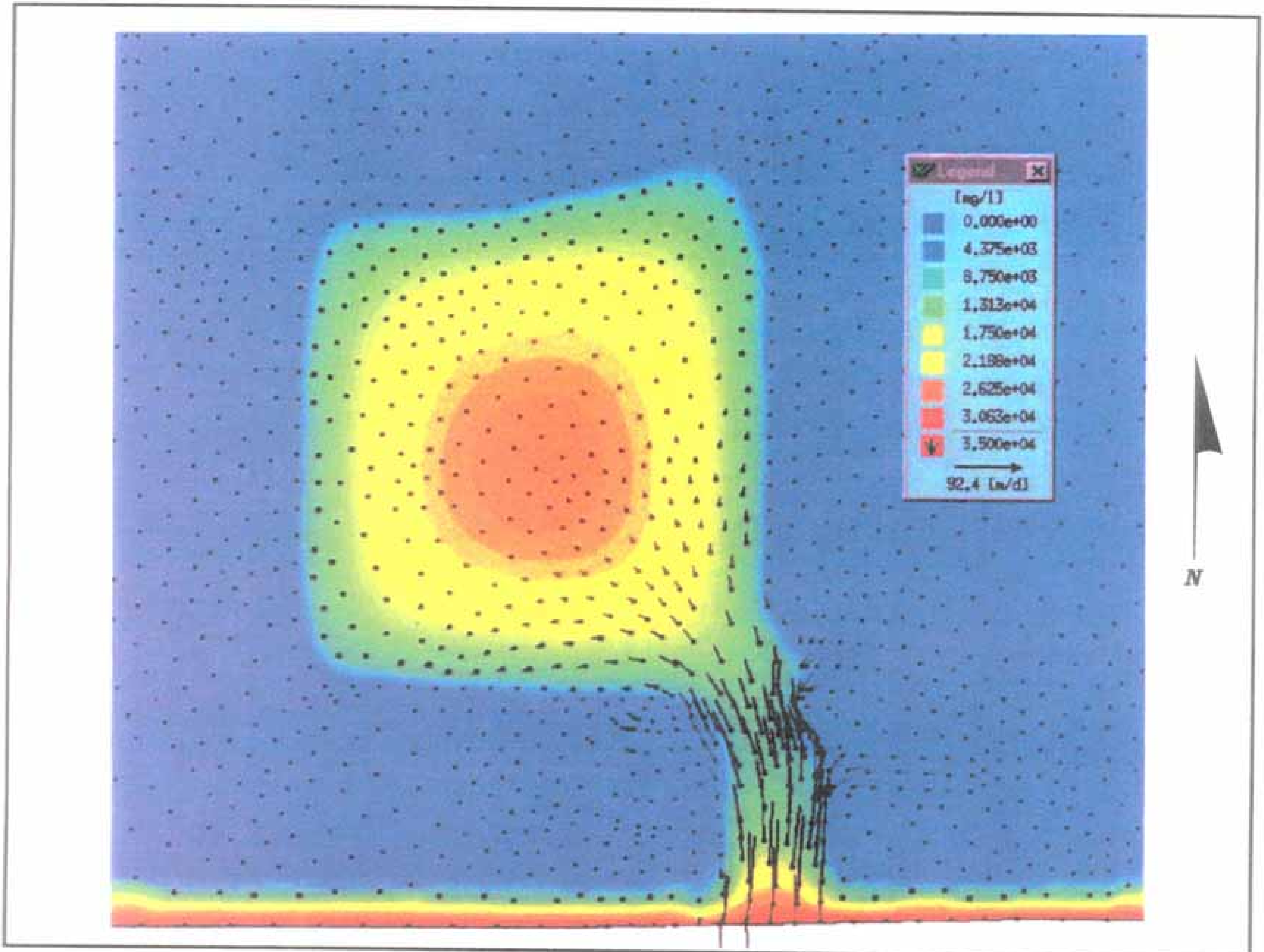

FIGURE 7-6. Distribution of dissolved solids concentrations in mg/l (body with Albany Marina, slice 2).

Section 8
Methods to Limit the Impacts of the Marina on Groundwater Quality

8.1 Introduction

The Albany House Marina is proposed to be constructed in the southeast corner of the project site. The marina consists of an access channel from the south and a marina basin to the north (**Figure 5-6**). The depth of the channel is proposed to be 18 feet below mean low water or about -17.5 feet NGVD. The depth of the marina basin will be sloped from the channel entrance into the basin with the depth being about -17.5 feet on the south side of the basin to -16.5 feet on the north side of the basin (all proposed depths are from Todd Turrell at Turrell & Associates, Inc.).

The objective of the hydrogeologic investigation and the groundwater modeling was to assess a reasonable method to protect the freshwater lens from being drained into the marina basin. A more detailed discussion of the modeling and the probable impacts is in Section 7.

There are two options for managing the freshwater lens from impacts caused by the marina. First, the base case is to assess what would occur if no action where taken to protect the freshwater lens north, east and west of the proposed marina basin. Second, the impacts were assessed of constructing a curtain wall along the north and parts of the western and eastern portion of the marina basin. The objective of the curtain wall would be to separate the freshwater in the upper part of the aquifer from the seawater within the marina basin and to prevent the freshwater from draining via subsurface flow into the basin.

8.2 Options for Protection of the Freshwater Lens

8.2.1 No Remedial Action

The construction of the marina will cause the loss of some stored freshwater beneath the site as can be observed in **Figures 6-6 and 6-8**. Since the marina will penetrate into the aquifer to a depth of 16.5 feet below sea level (NGVD), there is a significant possibility that the marina will act as a drain on the freshwater lens. There are two methods to evaluate the possible impacts of the freshwater loss. First, there is an existing excavation located on the south portion of the property. This excavation is constructed to a depth of about 12 feet below sea level. Although it is not connected by a channel to the sea, it does fluctuate with the tides. The water within the excavation contains 1600 mg/l of dissolved solids. It does appear to influence groundwater quality to a distance of between 50 and 100 feet to the north and to the northwest of the excavation edge. It must be observed that this excavation does not contain seawater with a dissolved solids concentration of 35,000 mg/l and is not directly opened to the sea. The tidal fluctuations of surface water within the basin would produce enhanced hydraulic slopes into and out of the groundwater system during tide changes. The apparent reason that the excavation does not have a greater effect on groundwater quality is also influenced by the relatively low hydraulic conductivity of the aquifer at shallow depths. An assessment of the marina impacts using the excavation is considered tentative at best.

The second method of analyzing impacts to the groundwater system from the marina is to construct a groundwater model using both flow and water quality components. A solute transport model was constructed as described in Section 7. This model was used to determine the area to be influenced by the marina and the annual loss of freshwater that would occur if no remedial action were taken to protect groundwater quality.

Surprisingly, the groundwater modeling showed that the effects of the marina basin were more vertical than horizontal. The model showed that the area that would be affected by the marina would extend about 300 feet to the north and 300 feet outward on the west and east sides of the property. There are some critical assumptions that are made in this model. The hydraulic conductivity was assumed to vary as shown in the test results. The aquifer hydraulic conductivity measured in the field in the depth range of the marina was rather low compared to typical limestone units found in the region. Values of 3 to 10 ft/day were used in the model for the depth penetration range of the marina basin. It was assumed that no significant cavities are found in the Lucayan Limestone Aquifer in the vicinity of the marina. Therefore, the impacts appear to be relatively small. However, if the limestone did contain some cavities and shallow flow conduits, the impact could be significantly higher than projected. So, there is some uncertainty in the simulation which merits a conservative approach to assessing and remediating the impact.

8.2.2 Construction of a Curtain Wall

One method of remediating the loss of freshwater to the marina is to separate the groundwater flow of freshwater from the marina. This objective can be achieved by the construction of a subsurface barrier to groundwater flow. The type of barrier appropriate for this project is termed a "curtain wall." A curtain wall typically is constructed by driving a rigid slab of reinforced concrete into the ground to form a wall, which cuts off water interchange between the marina basin and the groundwater system.

Since fresh water in the aquifer floats on the underlying, denser saline-water, a curtain wall forms a barrier to the horizontal flow of freshwater through the aquifer. This barrier changes a diversion of freshwater flow around the wall and tends to increase the thickness of freshwater at the point of flow obstruction. For practical purposes, a curtain wall acts as a dam to freshwater. Since there are practical and cost-sensitive issues with regard to the depth to which a curtain wall can be constructed, groundwater modeling was used to assess how much freshwater could be saved by construction of a curtain wall to various depths (**Figures 8-1** and **8-3**).

In many parts of the world, the perimeter of a marina basin would be hardened to the approximate basin depth or to some established depth below the bottom of the basin to prevent structural failure of the basin edges or the slump of sediments into the basin.

Wave activity caused by storms and boat wakes can cause significant erosion of the basin edges. At this location the geology of the subsurface would possibly allow the construction of the marina basin without a surrounding sea wall because the limestone, although soft, does have some structural integrity. So, the issue of basin edge protection may or may not be required at this site for strictly structural issues.

Although the risk of substantial freshwater loss into the basin via groundwater flow is not considered to be great, it is highly recommended that some type of curtain wall be constructed, which would act both to protect the basin edges from erosion and failure and to limit the loss of fresh groundwater. The primary issue is how deep the curtain wall should be constructed.

The groundwater model was used to assess a scenario with regard to the depth of the curtain wall/sea wall. The scenario evaluated was to place a 25-foot deep curtain wall along the full length of the northern boundary and part way to the south along the western and eastern margins of the basin (**Figure 8-3**). This would place the base of the barrier at about 19 feet below sea level, which is 2.5 feet below the bottom of the marina along the northern margin. The recommendation is to install a curtain wall from land surface to 25 feet below surface or a depth of about 19 feet below sea level. Comparisons of the margin of the marina basin without and with the curtain wall are shown in **Figures 8-1** and **8-2**. These illustrations are made with the assumption that there is some area of high hydraulic conductivity along the margin of the marina that could create a greater impact than predicted by the model. The recommended boundary of the curtain wall is shown on **Figure 8-3**.

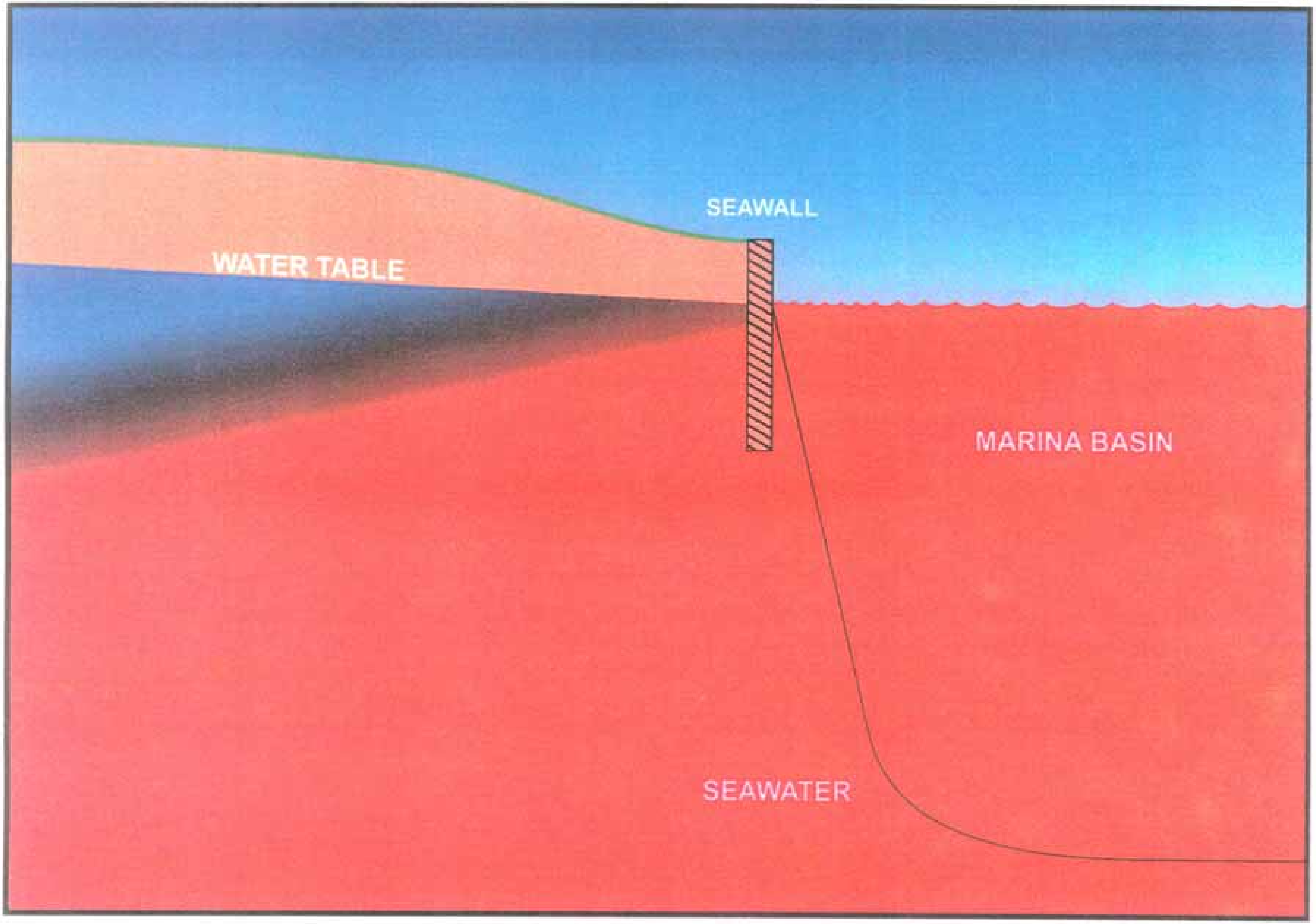

FIGURE 8-1. Freshwater lens impact with typical seawall construction.

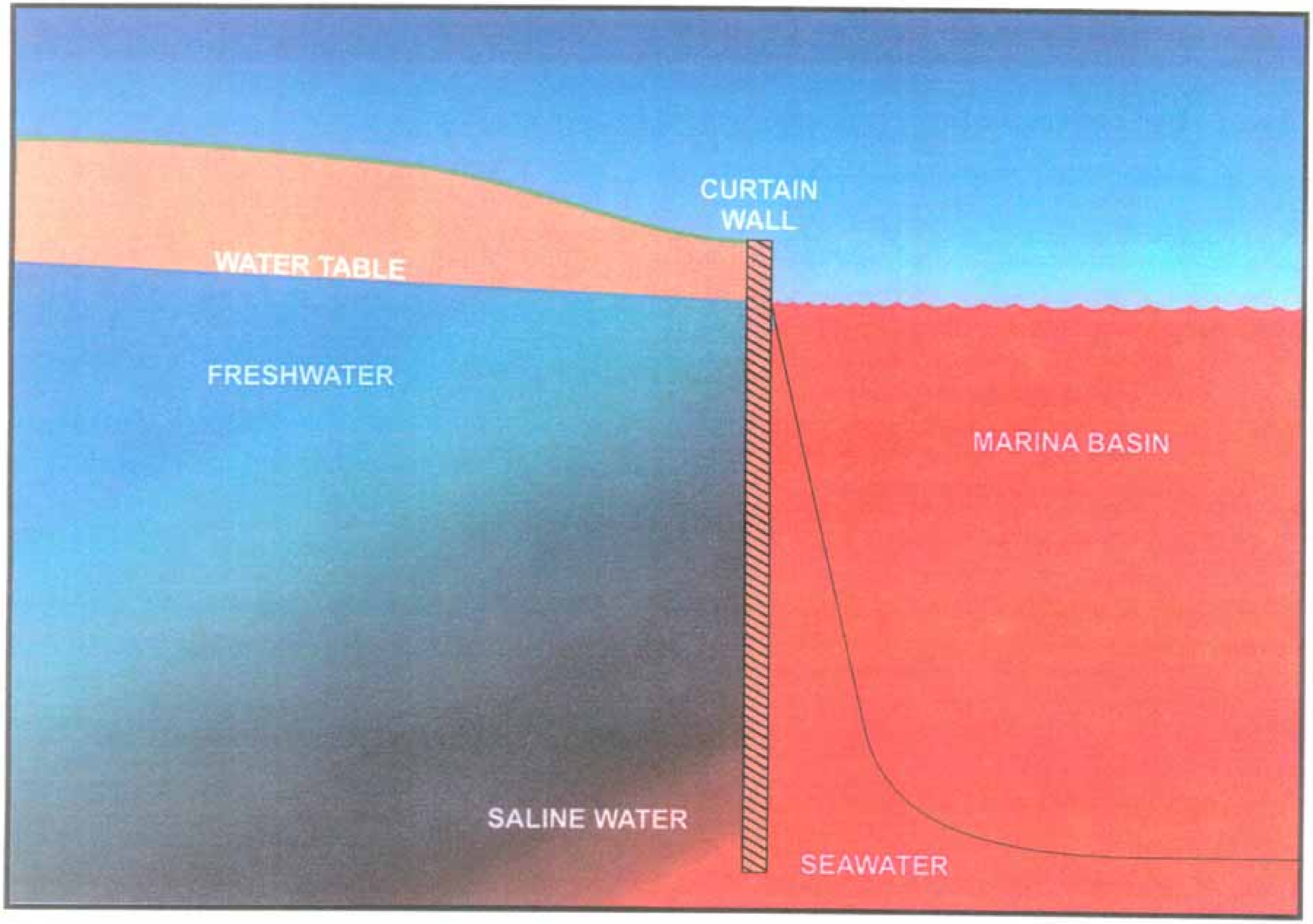

FIGURE 8-2. Concept of curtain wall to protect the freshwater lens.

FIGURE 8-3. Location and depth of curtain wall relative to marina bottom attitude.

Section 9
Lake Impacts

9.1 Introduction

A series of lakes are proposed for construction in the development and in the golf course area. In many residential and high quality golf course communities, lakes provide several benefits to the development. The excavations are commonly used as a source of fill material to elevate the land surface, for contouring of the golf course, and for construction of road beds. Lakes also provide a pleasing aesthetic aspect to the development. Because of the concerns over the impacts of lakes discussed herein, the area of lakes was reduced from 60 to 20 acres in the site plan.

Lakes are commonly constructed below the water table so they remain filled at all times of the year so as not to become unsightly during dry periods. Unfortunately, the impacts of lakes on an island containing a freshwater lens are quite different compared to the typical lakes constructed in a residential development on a mainland area such as Florida. Manmade lakes constructed in wet, semi-tropical areas such as Florida, have little environmental impact on the surficial aquifer system because they play a rather insignificant role in the water budget of the site, and the freshwater within the aquifer feeds the lakes, making them remain filled throughout the year. The lake levels rise and fall with the seasonal changes in the position of the water table. Also, the aquifer contains freshwater through its entire thickness and few problems occur during construction. On an island containing a limited freshwater lens, lakes extending below the water table play a very significant role in the local water budget. High rates of evaporation tend to discharge the freshwater into the atmosphere and create localized areas containing only brackish water of an unusable nature (**Figure 9-1**). Severe problems tend to occur during construction of the lakes because the aquifer is density-stratified, causing deep excavations to mix high-salinity water from deeper within the aquifer with the freshwater floating at the top of the aquifer. Also, the impact of a lake on the area below and around it tends to expand with time. This would significantly reduce the long-term viability of the aquifer to be used as a freshwater supply source in the future.

Some local examples on New Providence Island, where the construction of lakes has eliminated freshwater, are some of the excavations located to the west of the airport. It is extremely important to assess the need and the design of the proposed lakes on the site.

9.2 Options Available for Development of On-Site Lakes

9.2.1 Increase the Size of Alternative Water Supplies

One option is to construct the lakes and essentially sacrifice large portions of the freshwater lens. In this case the potential use of the aquifer for water supply would be eliminated, but would be replaced by development of supplemental water supplies, such

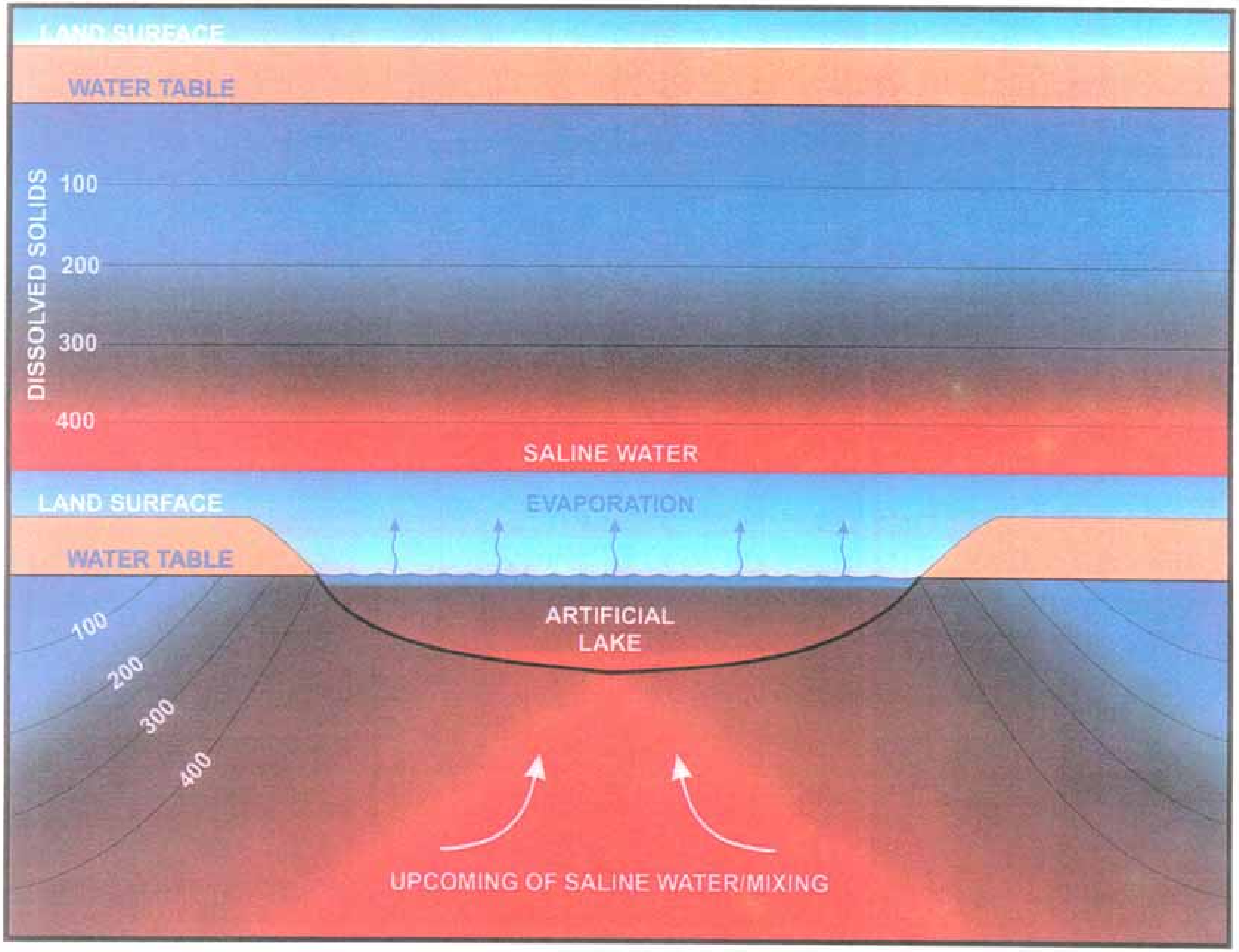

FIGURE 9-1. Effects of an artificial lake on the freshwater lens, cross-section view.

as increased reuse of treated domestic wastewater and desalinated seawater. An analysis of the need for supplemental water supplies is contained in Section 10 of this report and the economics of water treatment are provided in Section 11. This decision is one of economics and perhaps acceptable environmental impact by the Government of the Bahamas. If the aesthetic values provided by the lakes, without special construction methods, create value greater than the cost of adding additional desalination capacity, then the sacrifice of some freshwater areas of the aquifer may be deemed reasonable. Another economic consideration is that the water fields that remain to the north and east of the development project could also be impacted by any fully-penetrating lakes that occur near the property boundary. The lakes would become a freshwater sink, caused by evaporative water losses.

The area of lakes was reduced from 60 to 20 acres to reduce impacts. The loss of the freshwater lens for use on-site and the potential for impact to the remaining part of the freshwater lens offsite is considered to be economically and politically unacceptable.

9.2.2 Construction of Curtain Walls Surrounding the Lakes

One method that could be used to isolate the lakes from the freshwater lens is to construct a curtain wall that surrounds the lakes. The vertical permeability barrier would have to be constructed from about 3 feet above sea level (NGVD) to a maximum depth of about 40 feet below sea level (NGVD). It is necessary to place the top of the curtain wall significantly above sea level to avoid any possibility of saline water spillage over the top of the curtain wall during tidal fluctuations. Although the water level will fluctuate with the tides both on the interior and exterior of the isolated lake, any differential heads would absolutely prevent a problem from occurring. The curtain wall would have to be constructed prior to excavation of the lakes to limit saline-water contamination of the freshwater lens outside of the curtain wall (**Figure 9-2**).

The primary advantage of constructing a curtain wall surrounding the lakes is that the lakes would remain filled at all times of the year. The lakes would be recharged from the bottom up by saline water. No water would have to be added to the lakes to maintain an acceptable level. Also, the growth of freshwater aquatic weeds would be eliminated.

The disadvantage of constructing a curtain wall surrounding the lakes would be cost. Although the hydraulic conductivity of the shallow part of the aquifer system has been shown to be relatively low, there is some uncertainty in the amount of cement that would be required to construct the walls and the cost of prefabricated reinforced-concrete slabs would be quite high considering the required depth of about 42 feet.

9.2.3 Line the Lakes with Impervious Material and Pump Brackish-Water into the Lakes

All of the proposed lakes could be lined with an impermeable liner made from reinforced PVC sheeting or an alternative material. Another option would be to construct the lakes to a shallow depth and either place cement or bentonite onto the bottom of the lakes with

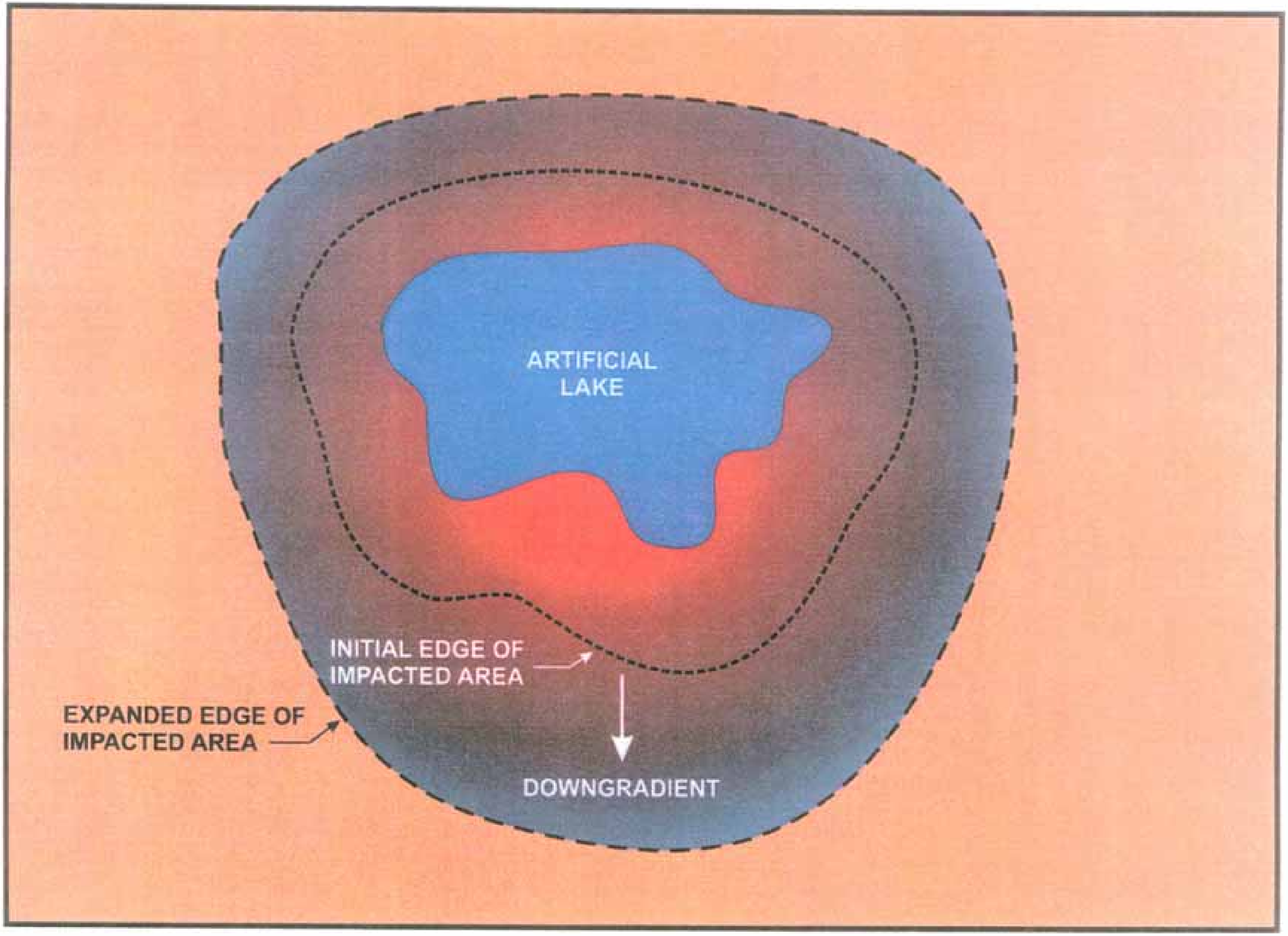

FIGURE 9-2. Effects of an artificial lake on the freswater lens, aerial view.

a sufficient thickness to permanently seal the bottoms. Water would have to be added to these lakes on a continuous basis to maintain the water level in the lakes. The designer may have to consider using circulation pumps to continuously allow the water to flow through the system. This would prevent an increase in salinity of the water as evaporation occurs. Seawater or brackish water pumped from deep in the ground could be used as the water source. It would be prohibitively expensive to use freshwater in these lakes.

The primary advantage to using a lake liner system is that any quality of water could be used in the lakes. A circulation system could be developed to pump seawater from the marina area or other down-gradient part of the development to the highest altitude lake and let gravity move the water from the highest lake through an interconnected lake network back to the marina basin on a receiving lake.

There are a number of disadvantages that merit consideration. First, the lake liners must be absolutely impermeable, because leaks of saline water into the lens would create contamination and could cause loss of its use. Second, if an impermeable fabric liner is used, then it must be constructed to a level at least 3 feet above any projected tide range within the groundwater system and the lakes must be kept at a limit above the maximum tide range. If upward differential pressure occurs vertically across the liner, it could tear or fail at the edges. This would cause leaks that would contaminate the freshwater lens. Third, the cost of the liners and the pumping system are serious considerations.

Section 10
Water Requirements for the Development and Supplemental Requirements

10.1 Potable Supply Requirements

Potable water will be supplied to the Albany House development either from the Bahamas Water and Sewer Authority. Potable water will be required for four different land uses on the project, which are: 1) single-family residential units, 2) multi-family residential units, 3) the marina for both live-aboards, boat water tanks, and for boat cleaning, and 4) commercial uses, such as restaurants and stores. A summary of estimated potable water use is given in **Table 10-1**.

Residential single-family water uses can be broken down into interior-home uses and exterior-home uses, which include watering of plants, lawns, and for cleaning purposes. Since central irrigation will be supplied to common-ground areas, it is assumed that exterior-home water use will be minimal at this site. High-end cost residential dwellings in South Florida have very high water use rates, commonly about 500 gallons per day per person (gpd/p). A large percentage of the water use is for exterior irrigation of landscape areas associated with the privately-owned lot. For estimation purposes, it is assumed that there will be roughly 350 single-family dwelling units constructed. Further, it is estimated that there will be 2.3 persons per unit and the water use rate will be about 170 gpd/p. These assumptions lead to an estimated single-family dwelling potable water use of 136,850 gpd. This number must be considered to be the approximate peak demand because many of the units will not be occupied during significant parts of the year. This number should be used to size utility facilities, because the peak demand may occur for in excess of 10 consecutive days, such as during holiday seasons. On-site storage may be used to help accommodate the peak demand.

Multi-family residents tend to use less water compared to single-family residents because they utilize common-ground irrigation systems, the occupation rate is lower, and the number of persons occupying a unit is lower. It is assumed that there will be about 150 multi-family dwelling units constructed. Further, it is estimated that the number of occupants per dwelling unit will be about 2.1. The estimated use rate will be about 130 gpd/person. This use rate with the 150 units produces an overall multi-family water use of 40,950 gpd. This is again an estimated peak rate based on 100 percent occupancy, which will not be common for these units.

Estimation of potable water use at the marina is somewhat problematical. The mix of boat sizes in most marinas in Florida is considerably greater than anticipated for the Albany Marina. Therefore, the marina potable water use rates will be higher than equivalent-sized facilities in South Florida. The estimated number of boat slips at the marina will be about 100. Based on the number of slips and the overall large size of the average boat, it is estimated that potable water use will be between 30,000 and 50,000 gpd. This is again a peak number because the use of the marina during off-season will

Table 10-1. Potable Water Supply Requirements

Item	Estimated Supply (gpd)
1. Single family residential (600 units)	137,000
2. Multi-family residential (250 units)	41,000
3. Marina (120 slips)	50,000
5. Commercial, mixed use (15 acres)	30,000
Total water use:	258,000

produce substantially lower water use rates. For estimation purpose, the high number or 50,000 gpd is used.

The last use of potable water will be by commercial users, such as the golf course clubhouse, restaurants, and stores. The estimated acreage of commercial users is about 15 acres. The estimated blended, mixed-use, commercial water use rate is 2000 gpd/acre, which yields an overall rate of 30,000 gpd.

This analysis is based solely on the land use scenario presented and will vary based on changes to the scenario as planning on the project progresses. The only potential increase in the peak demand for potable water would probably be an increase in exterior home use in single-family homes. This could increase by up to 20 percent depending on the landscape designs used.

10.2 Golf Course Irrigation Requirements

It is the intention of the golf course designers to use typical high bred turf grasses on the golf course and not salt tolerant type grasses. The use of salt tolerant grasses would be problematical, because the irrigation of the golf course with saline water would eliminate the use of the underlying aquifer as a source of freshwater for irrigation.

The most recent golf course plan calls for an irrigated area of about 80 acres with trees and grasses constituting about 15 acres of the facility. There will also be about 30 acres of lakes incorporated into the golf course design. Considerable analysis has been given to the irrigation requirements of turf grasses in areas that have a similar climate to New Providence Island. The average rainfall at the airport gaging station on New Providence Island was 54.99 inches/year for the period 1994 to the end of 2003 (HallTech, 2005a). The 80-year rainfall data base at Miami, Florida yields a long-term average rainfall rate of 56.74 inches/year.

A modified Blaney-Criddle analysis (U. S. Department of Agriculture, 1970) was conducted for the Albany golf course using the Miami data for rainfall, evapotranspiration, and other factors. It was assumed that the soil had a high vertical hydraulic conductivity and a factor of 0.8 was used. Also, it was assumed that the maximum irrigation requirement would occur in a 1- in 10-year dry period. This analysis yielded a supplemental irrigation requirement of 42.98 inches/year for the turf grass. The annual crop water use was determined to be 124.16 MG. This yields an average of about 340,000 gpd. The maximum month supplemental irrigation requirement would be about 16.437 MGD or about 548,000 gpd during the peak month. Although this analysis is based on a different location with a longer-term data base, it will be relativity close to the requirement at the Albany site. The error range should be no greater than 5 percent.

Another issue that requires consideration is the grow-in period for the turf grass. Commonly, after the initial sprigging of the turf grass, a large quantity of irrigation water is required to allow the grass to grow to a mature state. A plan must be made to deal with this issue. Sometimes a golf course is planted in two separate phases to reduce the burden on the water supply. In other cases the full water treatment capacity of the potable supply facility is diverted for irrigation use in the early stages of development.

10.3 Development Landscape Irrigation Requirements

Based on discussions with the planners, the common ground landscape acreage for the project will be about 60 acres. This area will be irrigated to provide the desired aesthetic values for an up-scale development. Irrigation of common grounds normally includes turf grasses and ornamental vegetation. Typically, the overall water use rate of common grounds vegetation in an up-scale development is quite similar to golf course turf grass water use.

Based on the assumption that the water use will be similar to turf grass, a Blaney-Criddle analysis was run for 60 acres of landscape area. Again, the long-term Miami rainfall and climatic database were used in the analysis. Similar soils were assumed along with the irrigation need during a 1- in 10-year low rainfall period. The water use requirement is 93.12 million gallons per year or an average day rate of 255,000 gpd. A peak month rate of 12.328 MG was calculated. This would be equivalent to a peak daily irrigation rate of 411,000 gpd. In certain cases the ornamental vegetation water use can be lowered by the use of specific plants. However, if turf grass is a large part of the common ground vegetation, then these use rates would be accurate.

The source of the irrigation water of the common-ground vegetation would be the same as for the golf course.

10.4 Overall Potable and Irrigation Water Requirements and Strategy

Water requirements for a high-economic end development are quite large. The overall peak day demand for potable water uses is estimated to be about 258,000 gpd (Table 10-1) and the over peak day irrigation water demand is about 1,000,000 gpd (**Table 10-2**).

The potable water supply will be obtained from the Government of the Bahamas. The irrigation water must be obtained from a combination of sources, which produce the most economic means of operation.

It is anticipated that the irrigation water will be obtained from three sources, which are: 1) water obtained from the aquifer beneath the Albany site, 2) treated domestic wastewater, and 3) water obtained from an on-site seawater reverse osmosis water treatment plant. It must be emphasized that the irrigation water quality must remain quite good to allow the continued use of the Albany development properties groundwater system as a source of water supply. The issues of the lakes, the marina, the quality of the treated wastewater,

Table 10-2. Irrigation Water Use Estimates

Type	Average Day Use (MGD)	Peak Day Use (MGD)
1. Golf course		
- 80 irrigated acres	0.34	0.540
- 15 acres of tees, greens		
2. Common grounds		
- 60 irrigated acres	0.255	0.411
Total irrigation use:	0.595	0.959

and the overall blend of the sources must be taken into consideration. Also, it will probably be necessary to construct an on-site storage tank with a capacity of about 1.5 MG to provide a reservoir for the irrigation water.

Based on the analyses of the sustainable yield of the aquifer on the northern part of the property and the treated wastewater volume that can be recovered, it is quite clear that the irrigation water supply must be supplemented by incorporating RO treated water or some water from the water fields on the NPDC land to the east and northeast of the Albany development. A summary of the volumes of irrigation water blend are given in **Table 10-3**. The amount of supplemental water for irrigation will be about 660,000 gpd.

Table 10-3. Irrigation Water Use by Source

Source	Water Supply (MGD)
1. On-site groundwater	0.24
2. Reclaimed water (treated wastewater)	0.10
3. Supplemental water (1)	0.66
Total water supply:	1.00

Section 11
Estimated Seawater Desalination Capacity and Associated Costs

11.1 Introduction

The irrigation water use supplemental supply required will be about 660,000 gpd. Therefore, the capacity of a seawater RO water treatment plant to meet the irrigation demand could be up to 1,000,000 gpd (1 MGD) if the grow-in period for the turf grass is considered. The demand on an RO facility would be less than 1 MGD at most times of the year, because the water uses are considered to be peak demand values. However, it is conceivable that these demands could occur for at least 2 months per year.

Since the development of supplemental water can be obtained via several different methods, costs for three plant sizes were estimated. This will allow a decision to be made on which option is most cost-effective for the project. Also, there are some very clear scaling factors with regard to the size of these plants. The cost per installed gallon of a facility goes down as the plant size increases. Since RO plants can be constructed in modules of specified sizes, the initial RO plant capacity could be lower and it could be increased as development water use increases.

These cost estimates are considered to be for planning purposes only and are not engineering cost estimates based on sets of specifications and drawings prepared and sealed by a professional engineer. The cost estimates do not include land, a building to house the RO plant, water storage, or a high service pump to send the water to a distribution system or the storage tanks.

A discussion concerning the specific issues for each size water treatment plant is given for all three capacities. A summary of the costs for the three plants is given in **Table 11-1**.

11.2 0.4 MGD Facility

A 0.4 MGD RO water treatment facility could be installed at the Albany site in the utility and maintenance yard. The main components of the facility include: 1) an RO water treatment plant that includes pre-treatment requirements, post-treatment, and controls, 2) two wells constructed into the upper part of the Pliocene dolomite aquifer with the well pump, valves, and controls (full back-up capacity), and 3) yard piping to connect the facility to the distribution system and storage tanks. The plant will require a building to protect it from the weather. The membranes would be contained in 2 skids with a capacity of 200,000 gpd each. The size of the building would be no larger than 1000 square feet or 25 by 40 feet. An office lying next to the building to hold the PLC and controls units with a desk for an on-site operator is an option. It may be prudent to air-

Table 11.1 Seawater Reverse Osmosis Facility Cost Estimates

Facility Components	Facility Sizes 0.4 MGD	 0.7 MGD	 1.0 MGD
1. Design/construction supervision	175,000	200,000	350,000
2. Well/wellhead/well pump	200,000	250,000	300,000
3. RO Plant	620,000	820,000	1,500,000
4. Concentrate disposal - injection well	200,000	225,000	250,000
5. Yard piping and well connections	30,000	40,000	60,000
6. Contingency (20%)	245,000	307,000	492,000
Totals	1,470,000	1,842,000	2,952,000

Notes:

1) All costs are in 2005 U. S. dollars.
2) There are no building or land costs contained in the estimates.
3) There are no import taxation costs included.

condition part of the building to protect the electrical controls and the computer controls from overheating.

Based on information from the suppliers of the RO plant, the anticipated feedwater will be pumped from the Pliocene dolomite aquifer beneath the site. The silt density index of the feedwater is anticipated to be quite low or below 3. The recovery rate will be about 50 percent. The rejection of dissolved solids will produce high quality water, which will have a very low dissolved solids concentration, but will likely require the addition of some alkalinity to adjust the pH, reduce the corrosion potential, and to improve the taste. This adjustment would be only for the potable supply water produced. If some of the water were to be used for irrigation, then some of the post-treatment processes could be eliminated for this stream. The cost estimate does contain the addition of sodium hydroxide to raise the pH. However, the addition of a calcite bed for adding hardness is not included. Based on the conversion of 50 percent, in order to produce 0.4 MGD, the production wells well must yield 0.8 MGD or about 560 gpm. The production of concentrate will be about 400,000 gpd or 280 gpm.

The raw water for the RO plant would be obtained from two wells drilled into the Pliocene dolomite aquifer. The production wells would be 12-inches in diameter and cased with polyvinylchloride (PVC) pipe. The estimated total well depth is about 320 feet and the cased depth will be about 170 feet. This diameter well will produce far more water than the necessary capacity of the plant from each well. The wells would be equipped with a stainless steel submersible pump and the appropriate valves and controls. This system allows for 100 percent redundancy and would allow flexibility if the plant is constructed in phases. The purchase of a spare well pump is recommended if either primary well pump fails. The back-order time for stainless steel submersible pumps can be extensive and seawater is quite corrosive, causing frequent pump failures.

Disposal of the concentrate from the RO water treatment facility will be by deep injection well. In this case, the rate of concentrate disposal is quite low at 280 gpm. The injection well would be constructed into the Miocene dolomite aquifer below the low hydraulic conductivity dolomite unit. It is anticipated that the well casing will be set and cemented into place at a depth of about 440 feet below surface. The estimated total depth of the well will be about 600 feet below surface. The well diameter will be at least 12 inches, but could be greater if any plant capacity increase is anticipated. There is no need for a second well for backup disposal.

11.3 0.7 MGD Facility

A 0.7 MGD RO water treatment facility could be installed at the Albany site in the utility and maintenance yard. The main components of the facility include: 1) an RO water treatment plant that includes pre-treatment requirements, post-treatment, and controls, 2) two wells constructed into the upper part of the Pliocene dolomite aquifer with the well pump, valves, and controls (full back-up capacity), and 3) yard piping to connect the facility to the distribution system and storage tanks. The plant will require a building to protect it from the weather. The membranes would be contained in 2 skids each with a capacity of 350,000 gpd. The size of the building would be no larger than 1000 square feet or 25 by 40 feet. It may be prudent to air condition part of the building to protect the electrical controls and the computer controls from over-heating.

Based on information from the suppliers of the RO plant, the anticipated feedwater will be pumped from the Pliocene dolomite aquifer beneath the site. The silt density index of the feedwater is anticipated to be quite low or below 3. The recovery rate will be about 50 percent. The rejection of dissolved solids will produce high quality water, which will have a very low dissolved solids concentration, but will likely require the addition of some alkalinity to adjust the pH, reduce the corrosion potential, and to improve the taste. This adjustment would be only for the potable supply water produced. If some of the water were to be used for irrigation, then some of the post-treatment processes could be eliminated for this stream. The cost estimate does contain the addition of sodium hydroxide to raise the pH. However, the addition of a calcite bed for adding hardness is not included. Based on the conversion of 50 percent, in order to produce 0.7 MGD, the production wells well must yield 1.4 MGD or about 980 gpm. The production of concentrate will be about 700,000 gpd or 490 gpm.

The raw water for the RO plant would be obtained from two wells drilled into the Pliocene dolomite aquifer. The wells would be 16-inch in diameter, well cased with polyvinylchloride (PVC) pipe. The estimated total well depth is about 320 feet and the cased depth will be about 170 feet. This diameter well will produce far more water than the necessary capacity of the plant from each well. The wells would be equipped with a stainless steel submersible pump and the appropriate valves and controls. This system allows for 100 percent redundancy and would allow flexibility if the plant is constructed in phases. The purchase of a spare well pump is recommended if either primary well pump fails. The back-order time for stainless steel submersible pumps can be extensive and seawater is quite corrosive, causing frequent pump failures.

Disposal of the concentrate from the RO water treatment facility will be by deep injection well. In this case, the rate of concentrate disposal is quite low at 490 gpm. The injection well would be constructed into the Miocene dolomite aquifer below the low hydraulic conductivity dolomite unit. It is anticipated that the well casing will be set and cemented into place at a depth of about 440 feet below surface. The estimated total depth of the well will be about 600 feet below surface. The well diameter will be at least 16 inches but could be greater if any plant capacity increase is anticipated. There is no need for a second well for backup disposal.

11.4 1.0 MGD Facility

A 1.0 MGD RO water treatment facility could be installed at the Albany site in the utility and maintenance yard. The main components of the facility include: 1) an RO water treatment plant that includes pre-treatment requirements, post-treatment, and controls, 2) two wells constructed into the upper part of the Pliocene dolomite aquifer with the well pump, valves, and controls (full back-up capacity), and 3) yard piping to connect the facility to the distribution system and storage tanks. The plant will require a building to protect it from the weather. The membranes would be contained in 4 skids each with a capacity of 250,000 gpd. This option is recommended because it could be developed in increments. The size of the building would be no larger than 3600 square feet or 45 by 80 feet. It will be necessary to air condition part of the building to protect the electrical controls and the computer controls from over-heating. Also, this building size includes an office and a room for controls.

Based on information from the suppliers of the RO plant, the anticipated feedwater will be pumped from the Pliocene dolomite aquifer beneath the site. The silt density index of the feedwater is anticipated to be quite low or below 3. The recovery rate will be about 50 percent. The rejection of dissolved solids will produce high quality water, which will have a very low dissolved solids concentration, but will likely require the addition of some alkalinity to adjust the pH, reduce the corrosion potential, and to improve the taste. This adjustment would be only for the potable supply water produced. If some of the water were to be used for irrigation, then some of the post-treatment processes could be eliminated for this stream. The cost estimate does contain the addition of sodium hydroxide to raise the pH. However, the addition of a calcite bed for adding hardness is not included. Based on the conversion of 50 percent, in order to produce 0.7 MGD, the production wells well must yield 2.0 MGD or about 1400 gpm. The production of concentrate will be about 1,000,000 gpd or 700 gpm.

The raw water for the RO plant would be obtained from two wells drilled into the Pliocene dolomite aquifer. The wells would be 20-inch in diameter well, cased with polyvinylchloride (PVC) pipe. The estimated total well depth is about 320 feet and the cased depth will be about 170 feet. This diameter well will produce far more water than the necessary capacity of the plant from each well. The wells would be equipped with a stainless steel submersible pump and the appropriate valves and controls. This system allows for 100 percent redundancy and would allow flexibility if the plant is constructed in phases. The purchase of a spare well pump is recommended if either primary well pump fails. The back-order time for stainless steel submersible pumps can be extensive and seawater is quite corrosive, causing frequent pump failures.

Disposal of the concentrate from the RO water treatment facility will be by deep injection well. In this case, the rate of concentrate disposal is quite low at 490 gpm. The injection well would be constructed into the Miocene dolomite aquifer below the low hydraulic conductivity dolomite unit. It is anticipated that the well casing will be set and cemented into place at a depth of about 440 feet below surface. The estimated total depth of the well will be about 600 feet below surface. The well diameter will be at least 20 inches, but could be greater if any plant capacity increase is anticipated. There is no need for a second well for backup disposal.

11.5 Phased RO Treatment Plant Development

One of the good things about RO water treatment plant development is that these facilities can be constructed in a modular fashion. It is common to construct the plant using a number of trains each having a set capacity. For example, a 1 MGD plant could be constructed with 4 trains, each having a capacity of 250,000 gpd. The plant could be constructed in phases of 250,000 gpd as the development proceeds.

Another major consideration is how to obtain the irrigation water to meet the extraordinary demand during the early stage of golf course development (early turf grass planting). A larger scale RO plant could meet this demand. Also, with 4 trains of 250,000 gpd each, the system could operate quite efficiently on a seasonal basis with only part of the plant running to meet the demand. The use of the trains could be rotated to maintain the membrane integrity. RO treatment capacity could also be used as backup in the event that a significant drought occurred on the island. A prolonged drought condition could significantly reduce the ability of the aquifer to yield the desired quantity of freshwater for maintenance of the golf course at the desired condition.

Section 12
Water Budget/Sustainable Yield for the Albany House Development Site

12.1 Introduction

The Albany House development can be divided into two parts; the area south of the road which includes the marina, and the area north of the road that contains the golf courses and large-scale housing. The south area covers about 70 acres and there is no plan to obtain any water from this area for irrigation supply. The area north of the road is approximately 455 acres and part of it will be used for the development of an irrigation water supply.

A key issue in the calculation of a sustainable yield of freshwater from the aquifer north of the road is how much area can be used for water development. The total acreage is approximately 455 acres. About 20 areas will be lakes and not usable for irrigation. Up to 100 acres will not be accessible for construction of a slotted pipe under-drain type collection system. Therefore, only about 335 acres of the north site will be available for use as a water supply for the irrigation requirements.

12.2 Water Budget for the North Part of the Albany House Development

The water budget for the property has been calculated based on the current condition and the future condition that allows the withdrawal of the maximum sustainable quantity of water on an annual basis. The water budget calculations consider the average condition, the 1-in 10-year low rainfall input, and the proposed land uses in the area.

A water budget is the balance between the inflow and outflow factors that govern the storage of freshwater beneath the site. Since this is an island, the water budget can be simplified into only a few inflow and outflow factors. The inflow factors for this site are rainfall and horizontal groundwater inflow. The outflow factors are evapotranspiration and groundwater outflow. For an average year it is assumed that the inflow and outflow are equal to produce a net freshwater storage change of zero in the aquifer. Based on the configuration of the property, in a natural condition the inflow and outflow of groundwater would be essentially equal for the property. However, the development scenario may cause the outflow of groundwater to be greater than the inflow depending on how subsurface discharge to the marina basin and enhanced evapotranspiration into the man-made lakes is mitigated.

The surface area of the entire northern part of the site is approximately 455 acres. The lake areas and impervious surface areas must be subtracted from the total area, so the remaining area is approximately 335 acres. This estimate is based upon a lake area of 20 acres and about 40 acres of impervious area, which includes roads, parking lots, house tops, sidewalks, and other uses. At least another 55 acres will not be available for use in development of water from beneath the site, but this area will still provide some recharge function. Based on the acreage available for recharge or 395 acres, the average rainfall inflow (54.34 inches per year) on this acreage produces 583 million gallons per year. In a 1- in 10-year drought (39.73 inches of rainfall), the inflow would be 426 million gallons per year. The groundwater inflow into the site was estimated based on a modified Darcy calculation using the following form of the equation:

$$Q = TIL(7.48),$$

where, Q is the discharge through the aquifer in gallons per day
T is the transmissivity in ft^2/day
I is the hydraulic gradient in ft/ft
L is the perimeter length through which water is flowing
7.48 is the conversion factor from cubic feet into gallons

The transmissivity used is the hydraulic conductivity times the thickness. The average hydraulic conductivity through the freshwater section of the aquifer is estimated to be about 15 ft/day and the maximum thickness of freshwater is about 40 feet. Therefore, the transmissivity used for the calculation is 600 ft^2/day. The hydraulic slope along the northern perimeter is believed to be lower than to the south near the sea. This slope is estimated to be about 0.004. The estimated length of the perimeter through which water is flowing onto the site is about 1400 feet (mostly northern boundary). Therefore, the groundwater inflow to the site is 25,133 gpd or about 9.1 million gallons per year. If the average hydraulic conductivity of the aquifer was underestimated by an order of magnitude and it was 150 ft/day, then the groundwater inflow could be as much as 91 million gallons per year.

In the natural condition, there are only two outflow factors, which are evapotranspiration and groundwater outflow. Cant and Weech (1986) estimated that the real evapotranspiration from the aquifer was about 25 percent of rainfall. Therefore, the amount of water that could recharge the aquifer is on the average about 13.59 inches per year. In a steady-state condition, where there is no net gain of freshwater storage during the year, the balance for removal of the excess freshwater that recharges the aquifer would be accomplished by groundwater outflow. This matches the observation that the hydraulic slope is greater near the shoreline compared to the interior of the island. Another balancing factor to achieve steady-state is that the evapotranspiration is unevenly distributed with greater rates occurring where the water table is closer to land surface and plants with shallow root systems can access the water. This loss would occur close to the shoreline area or in interior shallow depressions.

Based on the assumption that the evapotranspiration is 75 percent of the annual rainfall, the loss for the 395-acre site would be about 437 million gallons per year for an average year. In a 1- in 10-year drought the evapotranspiration loss would be 320 million gallons per year. To achieve a dynamic equilibrium in the year with the assumption that no change in storage occurs within the aquifer, then the groundwater outflow from the site would have to be 146 million gallons per year for an average year. The groundwater outflow loss in a 1- in 10-year drought would be about 106 million gallons per year. Again, this makes the assumption that the change in storage in the system is zero and therefore the thickness of the freshwater lens remains constant.

12.3 Sustainable Freshwater Yield from the North Area

12.3.1 Hydraulic and Climatic Considerations

The sustainable yield of an aquifer is defined as the amount of water that can be withdrawn which does not adversely affect the environment and does not deplete the water supply over the long term. Calculation of a sustainable yield from a freshwater lens on a carbonate island presents some challenges, because if the lens becomes depleted and the water becomes brackish, it may not recover for a considerable length of time.

One method of calculating the sustainable yield is to assume that the withdrawal from the aquifer will be no greater than the recharge to the aquifer in order to maintain a stable amount of storage in the system. If an annualized approach is used to obtain a gross sustainable yield number, then a recharge rate must be assumed. Cant and Weech (1986) concluded that the average recharge rate is about 25 percent of rainfall which would be 13.59 inches in an average year and in a 1- in 10-year drought would be 9.93 inches. An investigation conducted by HallTech (2005a) suggested that the recharge rate is lower or between 8 and 12 years per year. For water resources planning purposes it is prudent to consider drought conditions for assessing the sustainable yield. Therefore, the 1- in 10-year low rainfall and the lower end recharge estimate should be used to calculate the sustainable yield of the area north of Adelaide Road.

Based on an annual recharge rate of 8 inches per year, the annual sustainable yield would be about 86 million gallons per year. This would yield an average daily withdrawal rate of 235,000 gpd.

Another method of determining the sustainable yield is to assess the net rate of groundwater discharge to the sea or offsite in a 1- in 10-year drought. This outflow number was calculated to be 106 million gallons per year, which would allow an average day withdrawal of 290,000 gpd.

Based on this analysis, it can be concluded that about 235,000 gpd of freshwater could be obtained from the area north of the road to use for irrigation purposes. The design of the withdrawal system is critical to the long-term sustainability of this yield. Extreme drought conditions in a given year could reduce this number.

12.3.2 Water Quality Considerations

Use of the aquifer in the northern part of the Albany House development site is dependant on the design of the development. A detailed discussion of the affects of lakes on the freshwater lens is given in Section 9 of this report. The original 60 areas of freshwater lakes proposed could have significantly reduced the viability of the north area to produce freshwater on a sustainable basis, because of the potential of saline-water contamination. However, the reduction to 20 acres significantly reduces the potential impact.

Water quality in the northern area is a consideration in both the sustainable yield calculation and the effects of lakes on the long-term viability of the freshwater lens. It is suggested that the lakes be isolated from the aquifer by some method. If the lakes become brackish while the aquifer is being used to obtain a water supply, there is a high likelihood that saline water would spread outside of the lake areas into the aquifer. Saline-water intrusion caused by lakes could restrict the use of the aquifer in close proximity to the lakes for an irrigation water supply. Also, if a series of years occurred with below normal rainfall, such as 1961 to 1965 (see Table 3-1), the sustainable yield would be limited

The method of water extraction from the aquifer in the northern area must be carefully designed, constructed, and monitored to maintain water quality. Over-pumping of collection galleries or wells would cause a rapid increase in the salinity. Therefore, to develop 235,000 gpd of sustainable freshwater from the northern area, the extraction system must be carefully designed, operated, and monitored.

Section 13
Water Budget for Adjacent New Providence Development Corporation Limited Lands

13.1 Introduction

After the development of the Albany House project, there will be about 1500 acres of water fields area remaining for operation of freshwater extraction. This area is shown on **Figures 2-3** and **2-4**. An investigation of the water fields was conducted for New Providence Company by Halltech (2005a). This report stated that of the 900,000 gpd being extracted from the water fields, water was being withdrawn from only 10 percent of the area. This has resulted in the vertical movement of saline water into parts of the site.

It is the purpose of this section of the report to assess the potential impacts of the Albany House development on the existing water fields and to re-examine the sustainable yield of the remaining lands.

13.2 Water Budget for Remaining Water Fields Lands

The water budget for the 1500 acres of the remaining water fields has been calculated using a similar methodology compared to the Albany House development site. The water budget calculations consider the average condition, the 1-in 10-year low rainfall input, a 5-year return time low rainfall period, and the proposed land uses in and adjacent to the land.

A water budget is the balance between the inflow and outflow factors that govern the storage of freshwater beneath the site. Since this is an island, the water budget can be simplified into only a few inflow and outflow factors. The inflow factors for this site are rainfall and horizontal groundwater inflow. However, in the case of the water fields area, it straddles the hydraulic divide on the island and groundwater is not a significant factor in the inflow to the site. Only rainfall is considered as an inflow factor. The outflow factors are evapotranspiration and groundwater outflow. For an average year it is assumed that the inflow and outflow are equal to produce a net freshwater storage change of zero in the aquifer. Therefore, the general analysis is based on consistency of the inflow and outflow factors for one year to the next. It is assumed that the freshwater lens is in a dynamic equilibrium with rainfall being the only inflow factor, recharge being constant from one year to the next, and the sum of evapotranspiration and groundwater outflow being equal to the rainfall. In order for the balance to be maintained, the dynamic equilibrium requires that the recharge from rainfall be equal to groundwater discharge at the edges of the freshwater lens along the freshwater/saline interface. Since hydraulic conductivity increases with depth (see Section 5), as the freshwater lens thickens in the center of the island the hydraulic gradient increases and the freshwater tends to depress into higher hydraulic conductivity parts of the aquifer. This causes a tendency for very high rainfall years to have a lesser impact on the aquifer system (storage of freshwater) than would normally be expected.

The surface area of the remaining water fields is about 1500 acres. There are some lake areas, which should be subtracted from the total area, but the water budget will be calculated for the entire 1500 acres. Based on the acreage available for recharge or 1500 acres, the average rainfall inflow (54.34 inches per year) on this acreage produces 2213 million gallons per year. In a 1-in 10-year dry condition the rainfall would be only 39.73 inches (higher of the two estimates). This would reduce the rainfall inflow to 1618 million gallons per year.

In the natural condition, there are only two outflow factors, which are evapotranspiration and groundwater outflow. Cant and Weech (1986) estimated that the real evapotranspiration from the aquifer was about 25 percent of rainfall. Therefore, the amount of water that could recharge the aquifer is on the average about 13.59 inches per year. In a steady state condition, where there is no net gain of freshwater storage during the year, the balance for removal of the excess freshwater that recharges the aquifer would be accomplished by groundwater outflow. This matches the observation that the hydraulic slope is greater near the shoreline compared to the interior of the island. Another balancing factor to achieve steady-state is that the evapotranspiration is unevenly distributed with greater rates occurring where the water table is closer to land surface and plants with shallow root systems can access the water. This loss would occur close to the shoreline area or in interior shallow depressions.

Based on the assumption that the evapotranspiration is 75 percent of the annual rainfall, the loss for the 1500 acre site would be about 1659 million gallons per year for an average year. In a 1- in 10-year drought the evapotranspiration loss would be 1215 million gallons per year. To achieve a dynamic equilibrium in the year with the assumption that no change in storage occurs within the aquifer, then the groundwater outflow from the site would have to be 554 million gallons per year for an average year. The groundwater outflow loss in a 1- in 10-year drought would be about 403 million gallons per year. Again, this makes the assumption that the change in storage in the system is zero and therefore the thickness of the freshwater lens remains constant

13.3 Sustainable Yield of Water Fields Lands

13.3.1 Climatic and Hydraulic Considerations

The sustainable yield of an aquifer is defined as the amount of water that can be withdrawn which does not adversely affect the environment and does not deplete the water supply over the long term. Calculation of a sustainable yield from a freshwater lens on a carbonate island presents some challenges, because if the lens becomes depleted and the water becomes brackish, it may not recover for a considerable length of time. This analysis is very similar to that conducted for the Albany House development lands.

One method of calculating the sustainable yield is to assume that the withdrawal from the aquifer will be no greater than the recharge to the aquifer in order to maintain a stable amount of storage in the system. If an annualized approach is used to obtain a gross sustainable yield number, then a recharge rate must be assumed. Cant and Weech (1986) concluded that the average recharge rate is about 25 percent of rainfall which would be 13.59 inches in an average year and in a 1- in 10-year drought would be 9.93 inches. An investigation conducted by HallTech (2005a) suggested that the recharge rate is lower or between 8 and 12 years per year. For water resources planning purposes it is prudent to consider drought conditions for assessing the sustainable yield. Therefore, the 1 in 10-year low rainfall and the lower end recharge estimate should be used to calculate the sustainable yield for the remaining water fields area.

Based on an annual recharge rate of 8 inches per year, the annual sustainable yield would be about 326 million gallons per year. This would yield an average daily withdrawal rate of 892,000 gpd. Cant (1980) estimated that the "safe yield" of the aquifer is about 550 gpd per acre. If the "safe yield" estimate of Cant (1980) was considered to be equal to the sustainable yield, then this would allow 825,000 gpd to be pumped.

Another method of determining the sustainable yield is to assess the net rate of groundwater discharge to the sea or offsite in a 1- in 10-year drought. This outflow number was calculated to be 403 million gallons per year, which would allow an average day withdrawal of 1,100,000 gpd.

Based on this analysis, it can be concluded that about 892,000 gpd of freshwater could be obtained from the water fields remaining after development of Albany. The design of the withdrawal system is critical to the long-term sustainability of this yield as pointed out by Halltech (2005a). Extreme drought conditions in a given year could reduce this number. Also, the occurrence of a 5-year period of low rainfall, such as occurred between 1961 and 1965, could severely reduce the sustainable yield.

13.3.2 Water Quality Considerations

Currently, about 900,000 gpd of freshwater is removed from the water fields area. There have been serious problems from over-pumping of the lens based on the trench system scheme and the locations of the pumps. An investigation of the water fields conducted by Halltech (2005a) concluded that the 900,000 gpd was being pumped from only about 10 percent of the land area covered by the water fields. This has caused the vertical intrusion of saline-water into the system at various points as shown in the water quality samples collected from the trenches in the Halltech (2005a) investigation and the occurrence of saline-water in some of the wells installed in this investigation (Figure 6-5). Also, the excavation of lakes in the water fields area has increased the evaporative loss rates to further place stress on a delicate system.

Based on the sustainable yield analysis, it is possible to maintain the existing extraction rate of freshwater from the remaining water fields lands. This will require a re-design of the extraction system and a large increase in the number of pumps. The development of the Albany House lands should not impact the remaining water fields land, if no deep lakes are installed on the Albany House development in the area adjacent to the water fields lands, and any lakes that are installed within 300 feet of the water fields area, should be isolated from the freshwater lens.

Section 14
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Appendix A

Water Level and Hydraulic Analysis Data

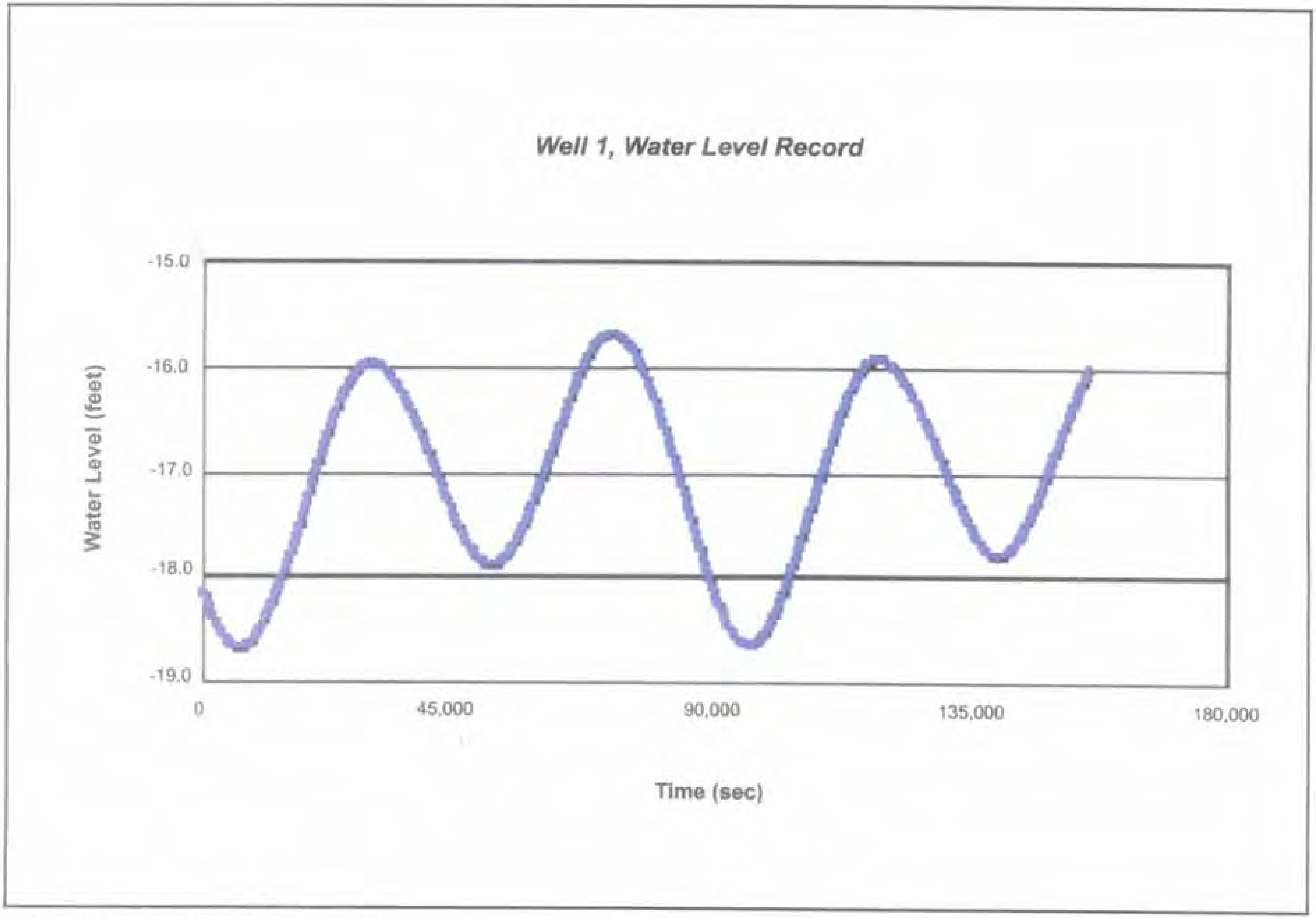

FIGURE A-1. Well 1 water level record.

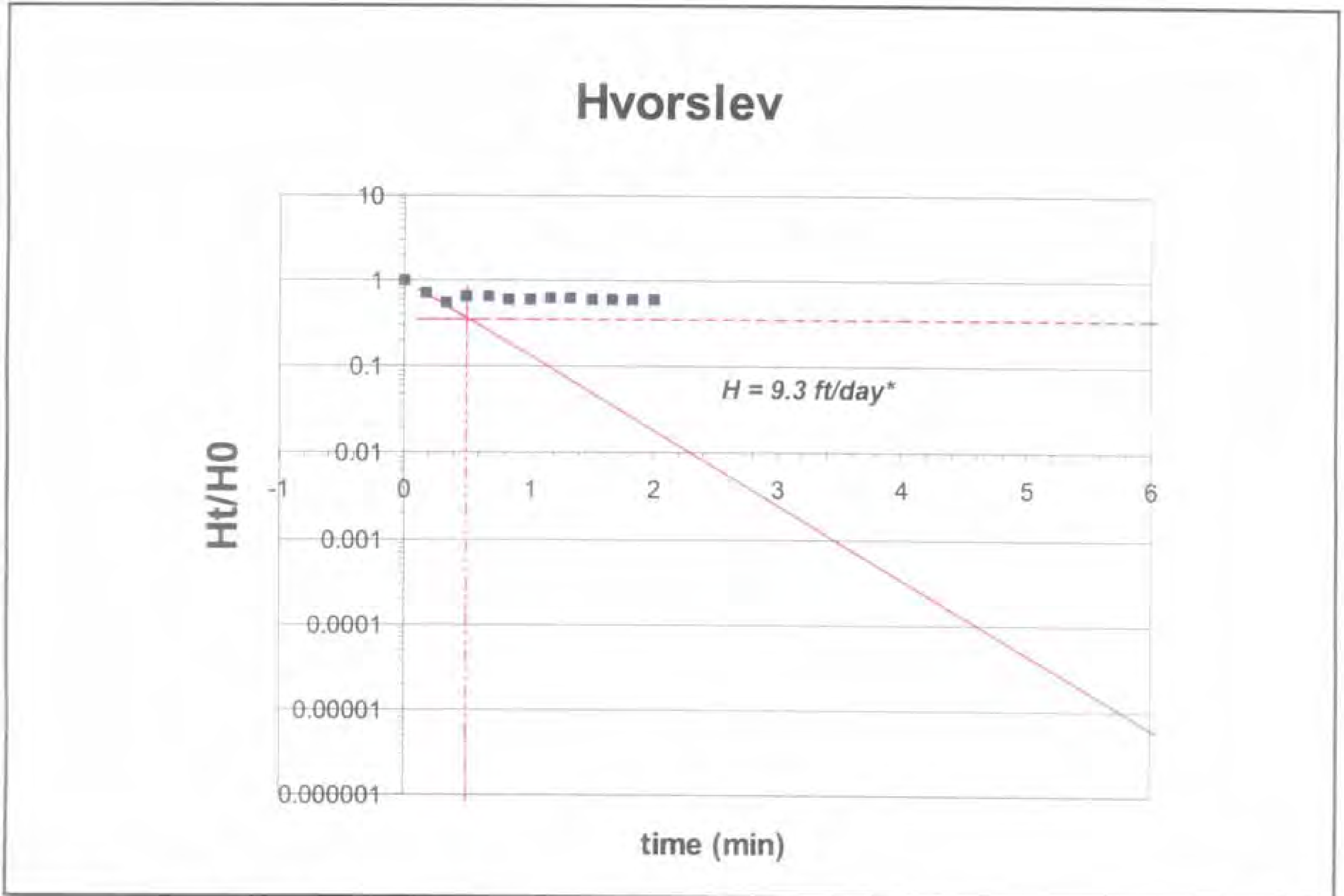

FIGURE A-3. Well 1 slug test data, Hvorslev analysis.

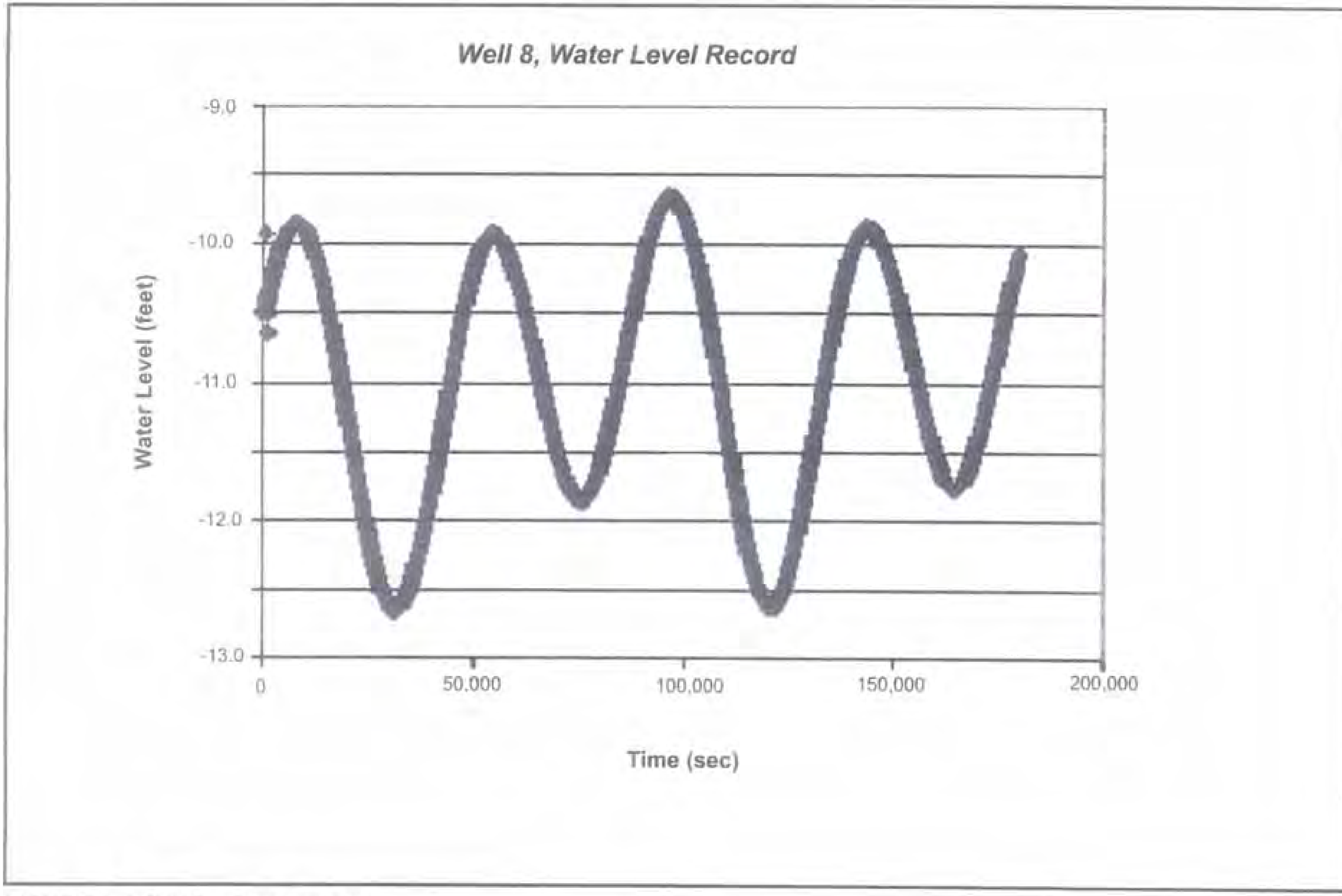

FIGURE A-4. Well 8 water level data.

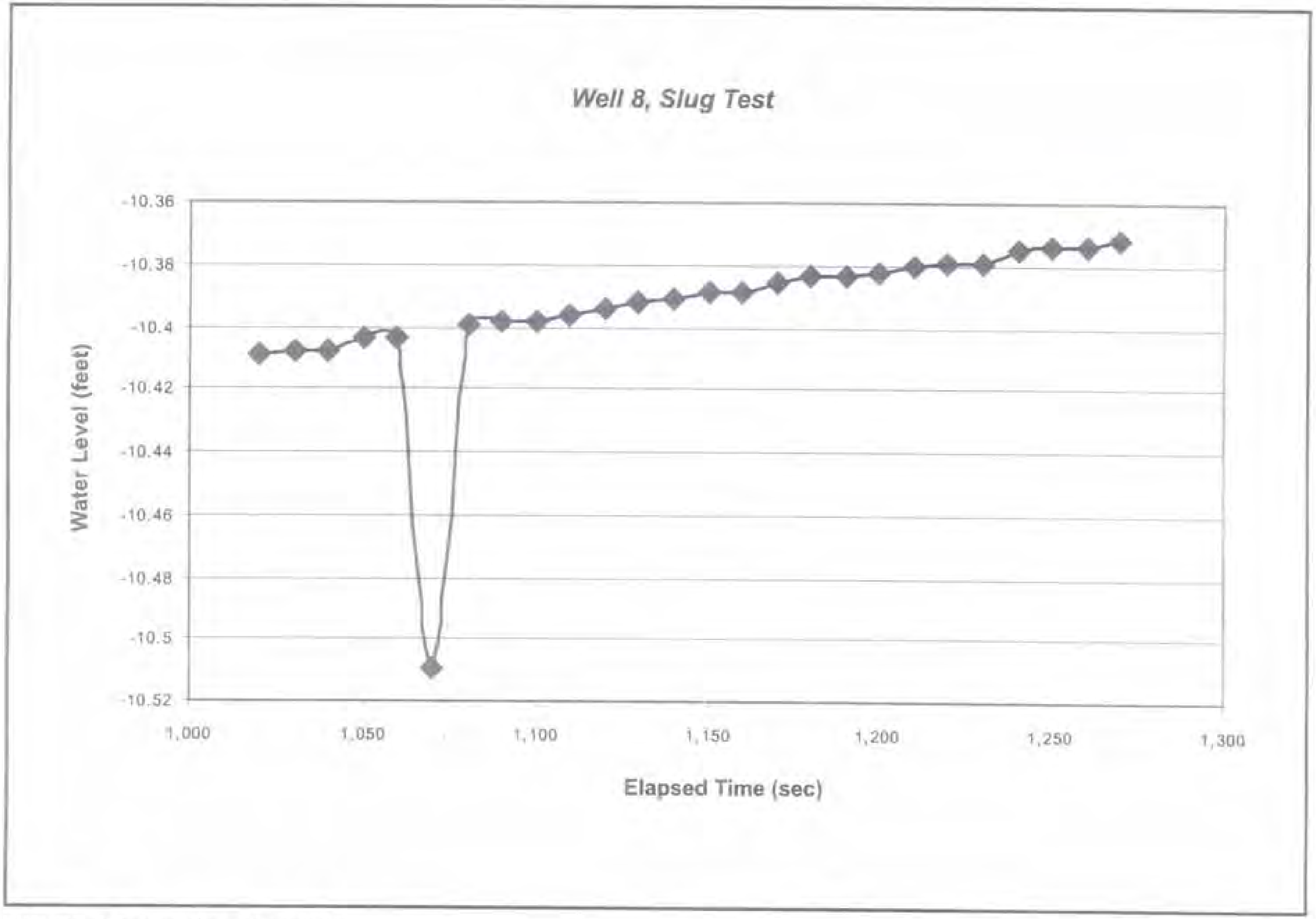

FIGURE A-5. Well 8 slug test data.

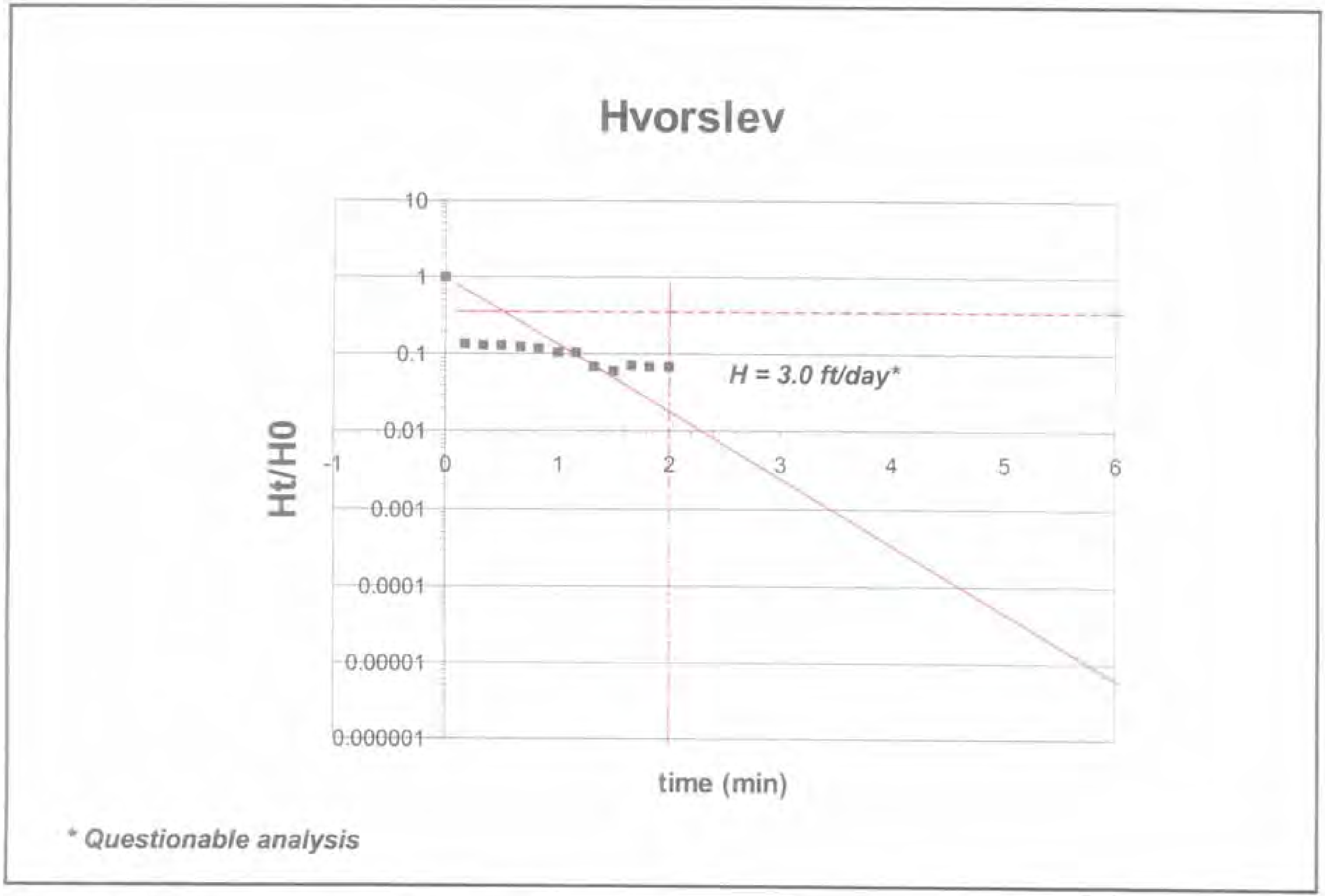

FIGURE A-6. Well 8 slug test,Hvorslev Analysis.

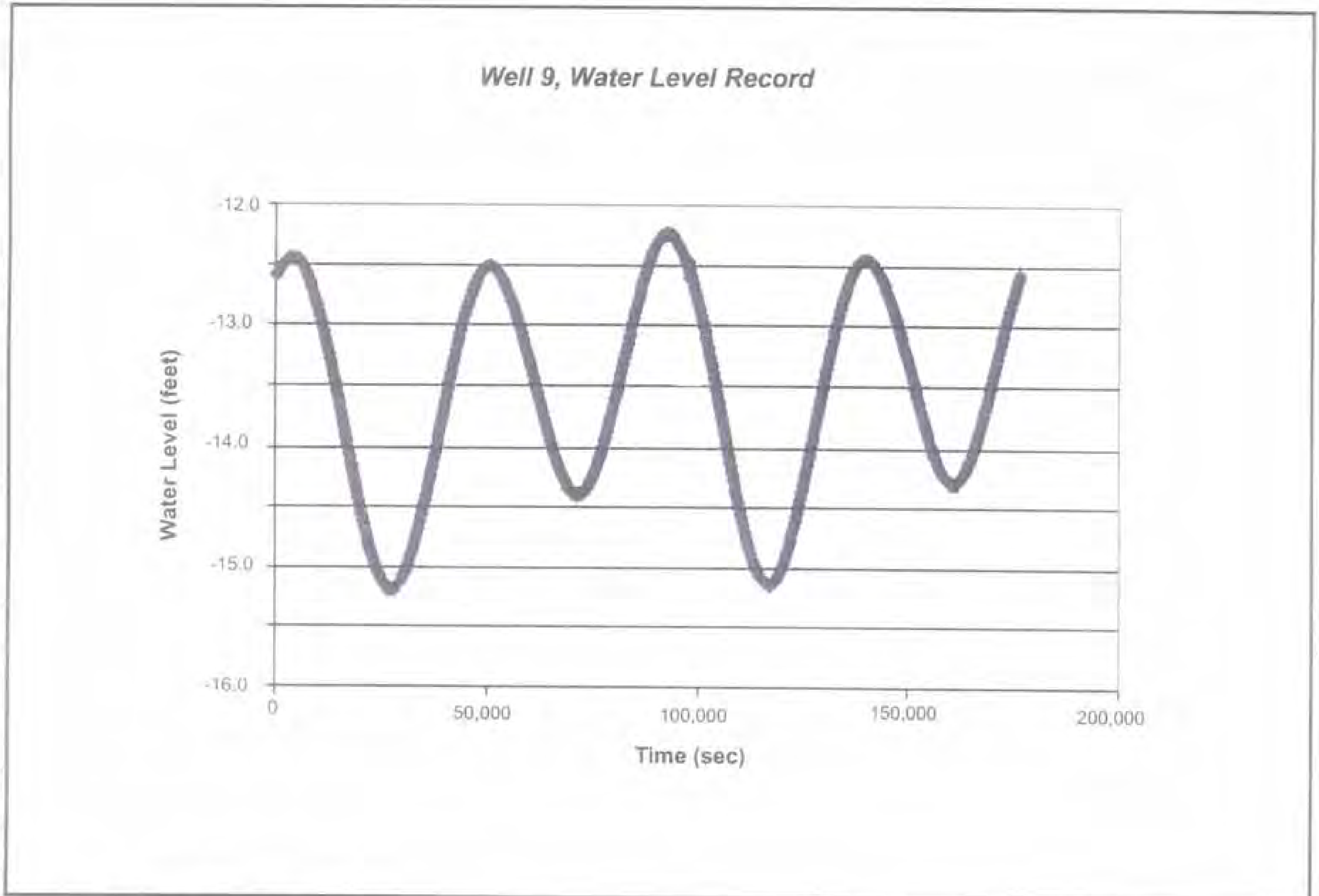

FIGURE A-7. Well 9 water level data.

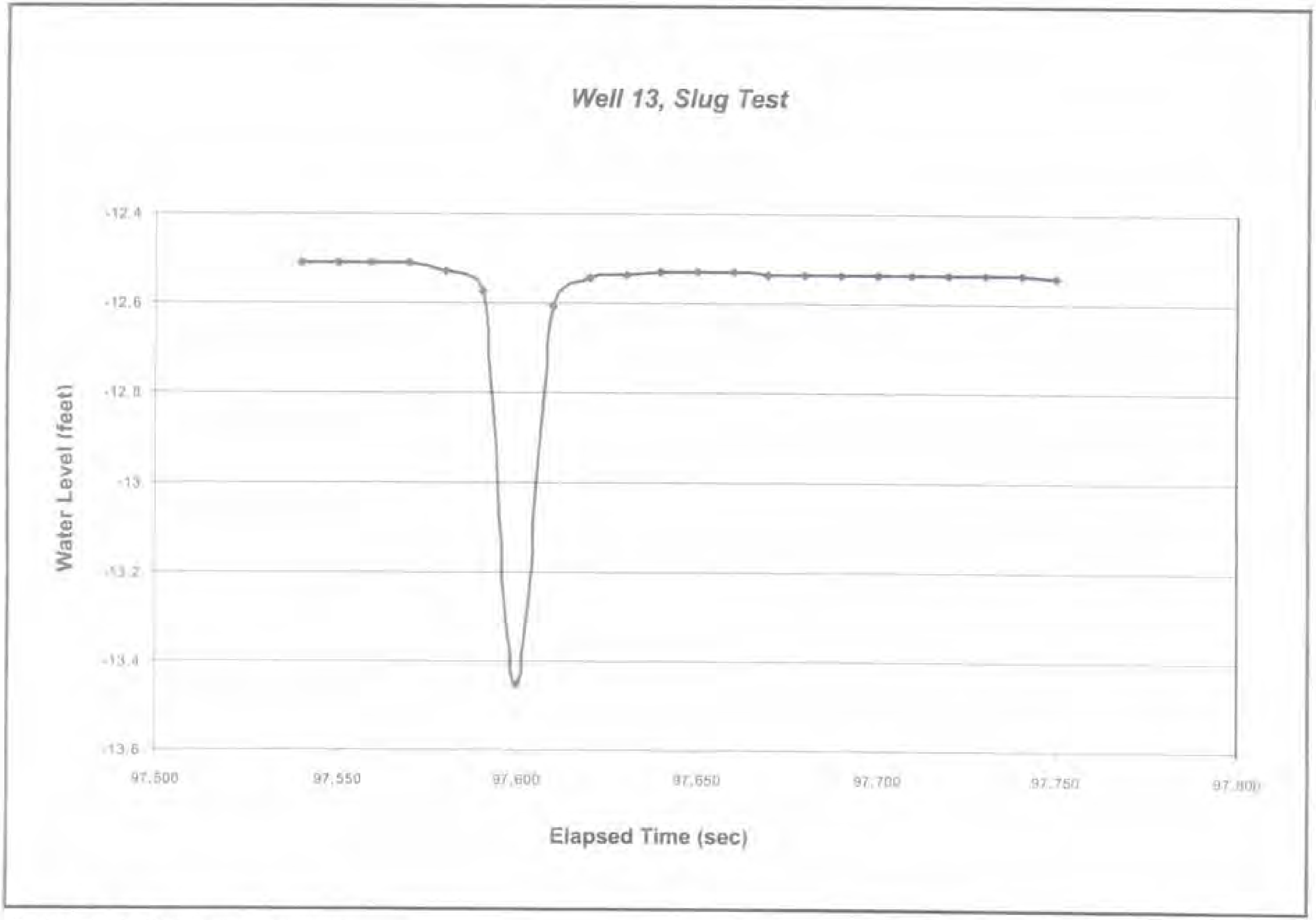

FIGURE A-8. Well 9 slug test data.

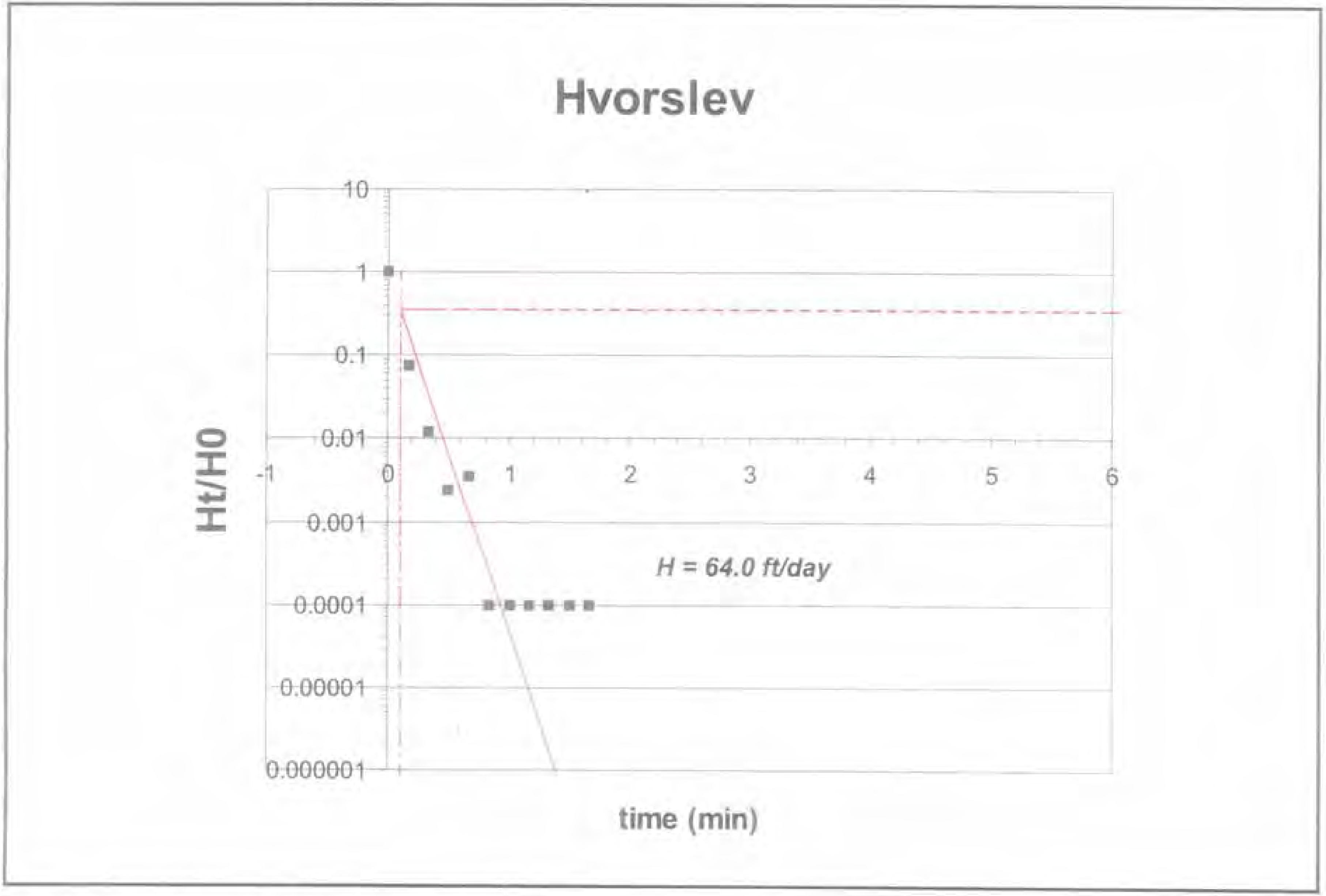

FIGURE A-9. Well 9 slug test, Hvorlev Analysis.

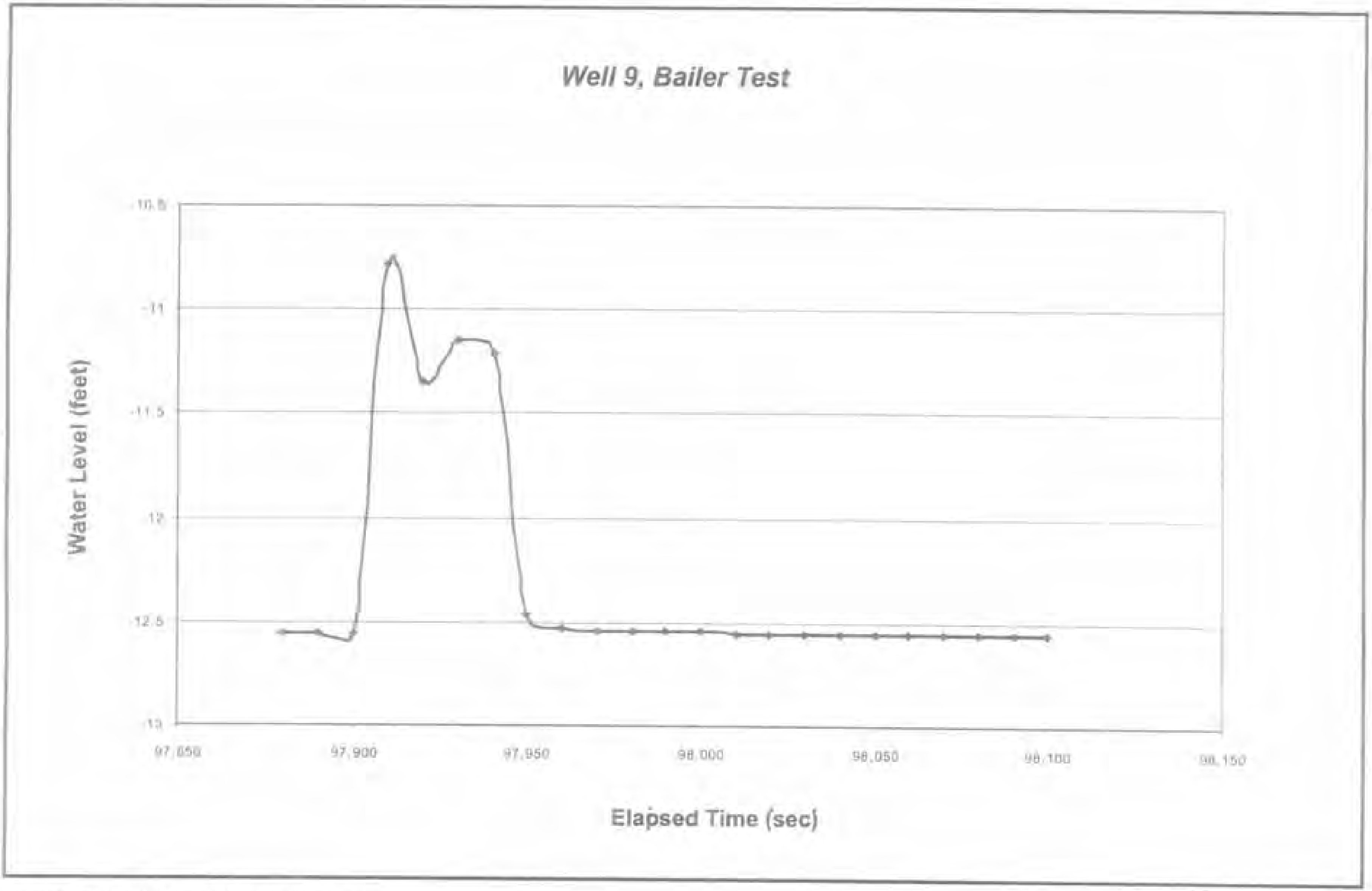

FIGURE A-10. Well 9 bailer test data.

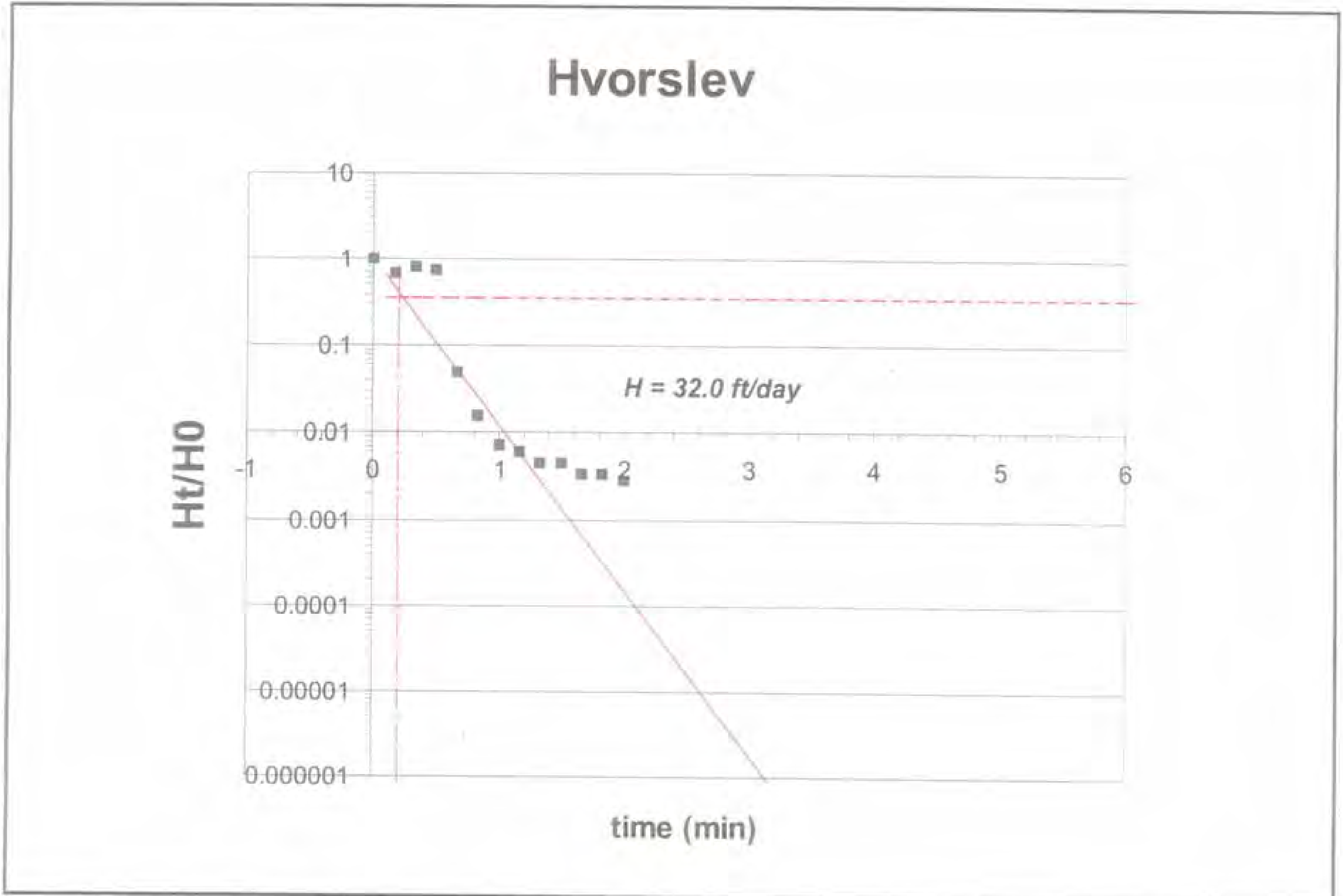

FIGURE A-11. Well bailer test, Hvorslev Analysis.

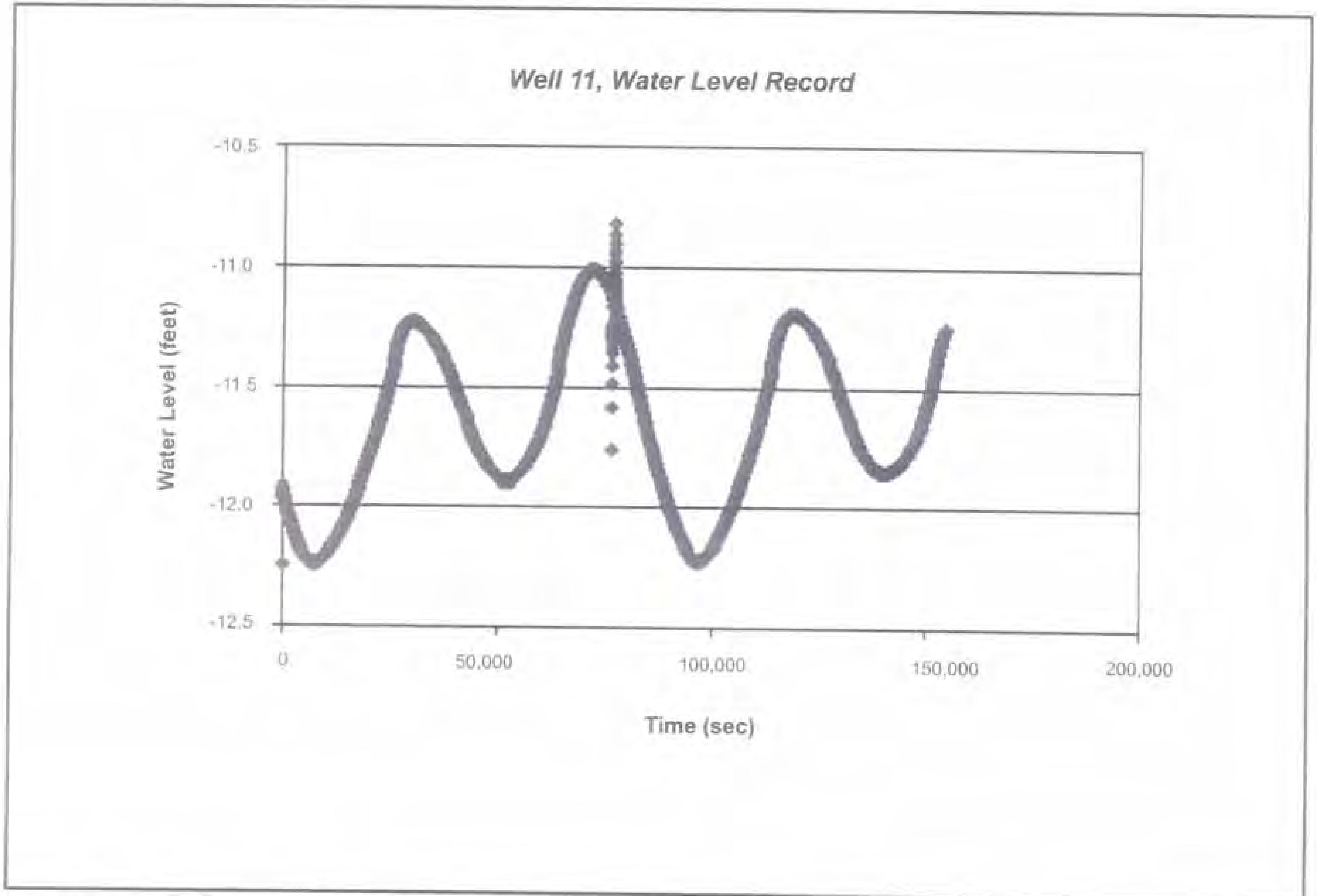

FIGURE A-12. Well 11 water level data.

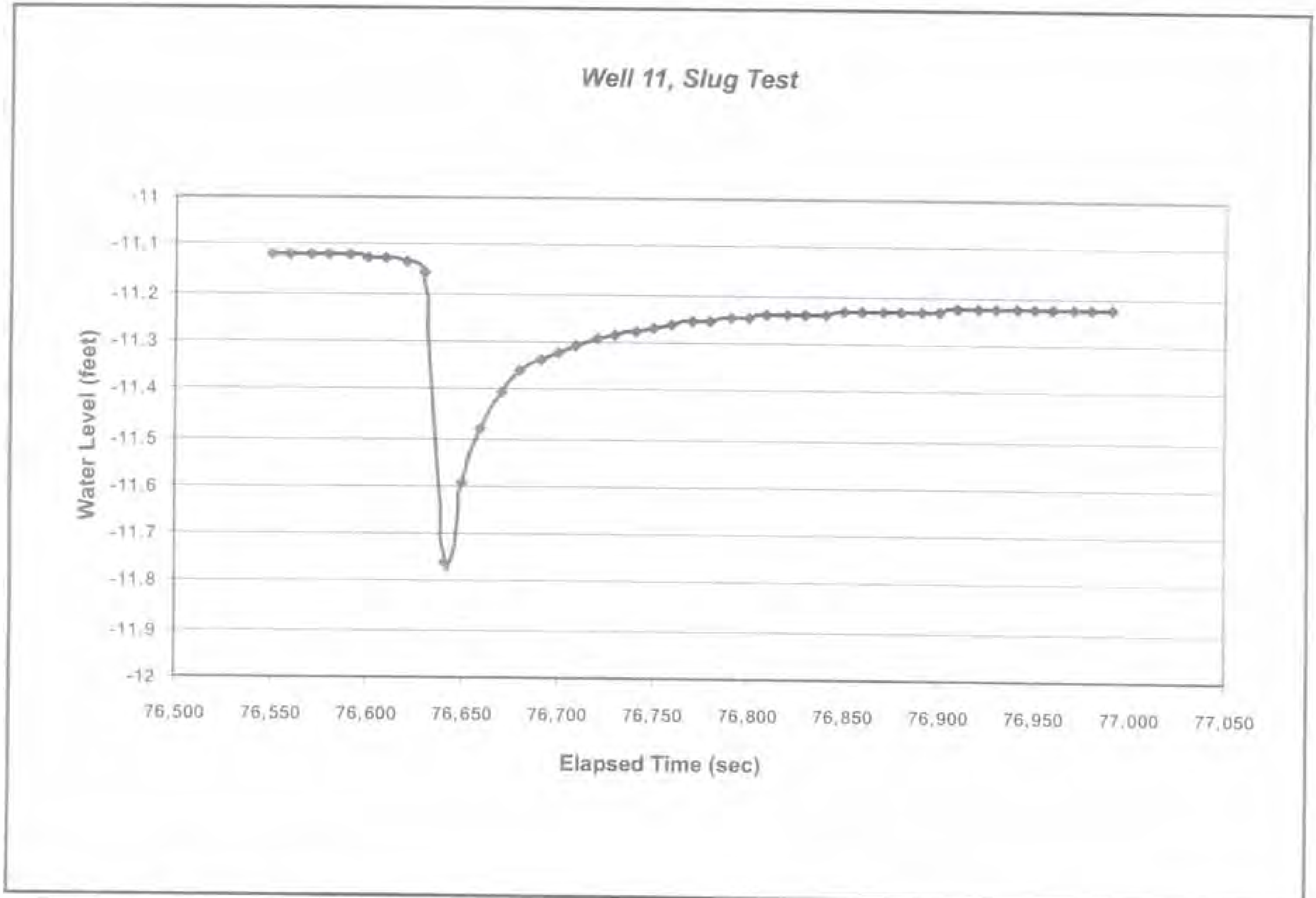

FIGURE A-13. Well 11 slug test data.

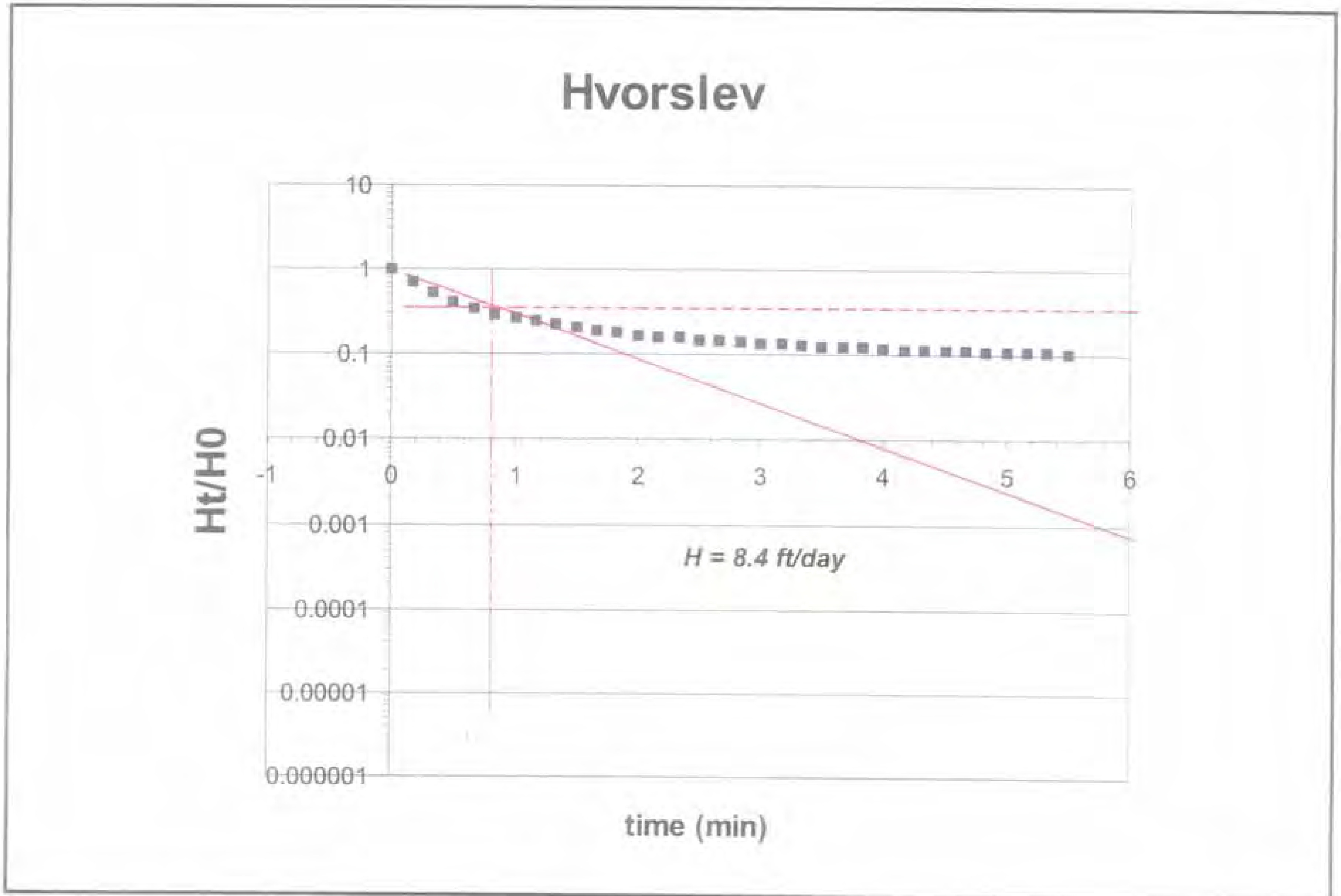

FIGURE A-14. Well 11 slug test, Hvorslev Analysis.

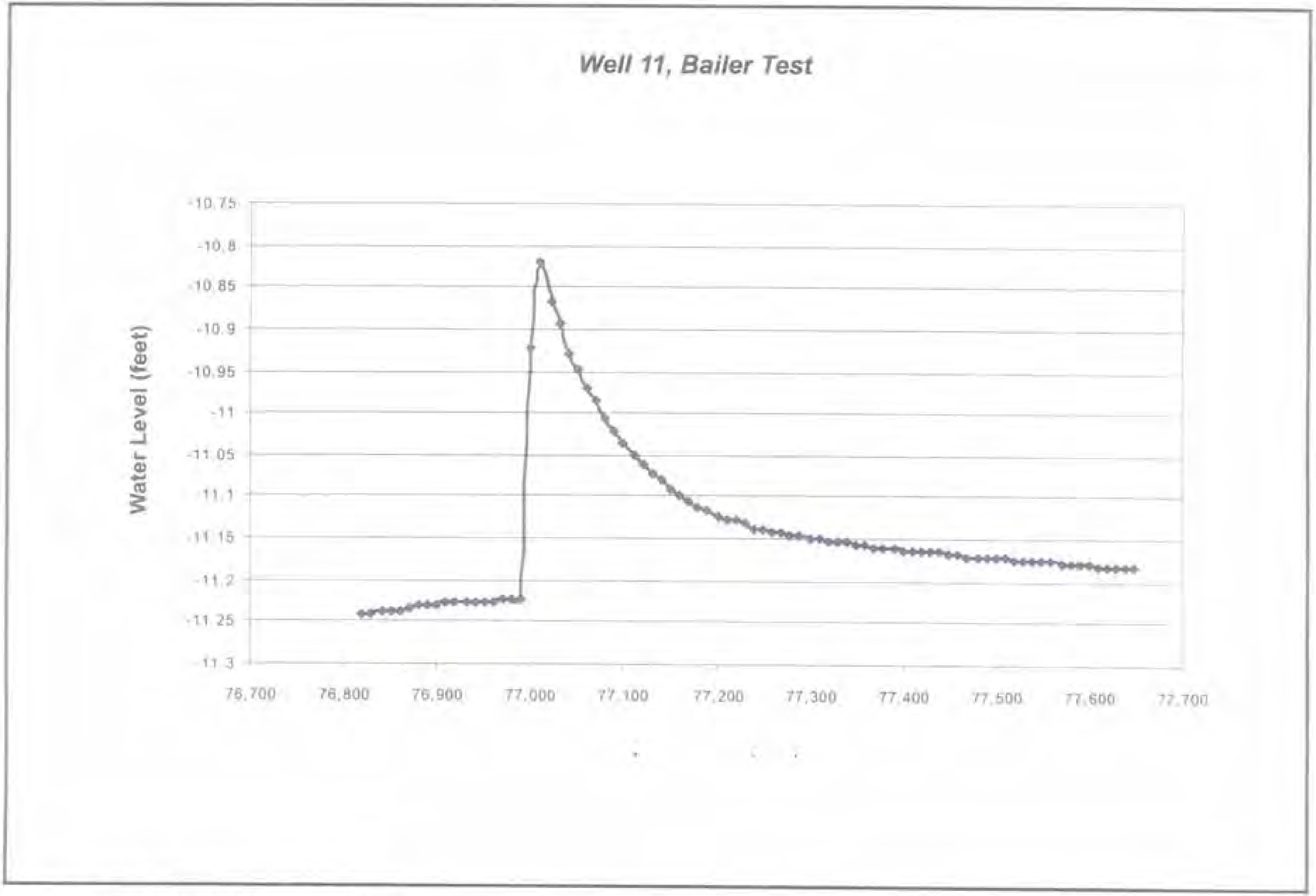

FIGURE A-15. Well 11 bailer test data.

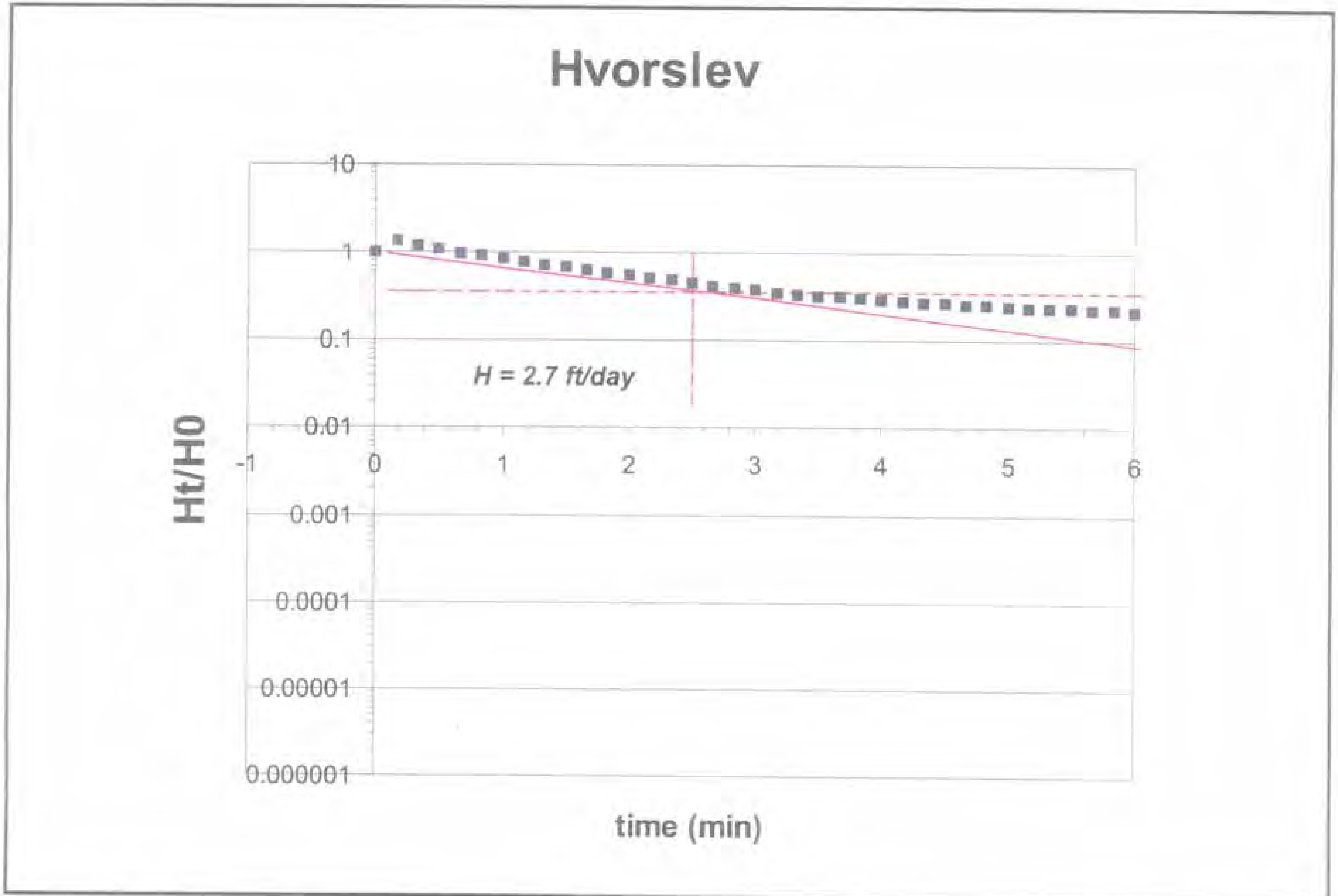

FIGURE A-16. Well 11 bailer test, Hvorslev Analysis.

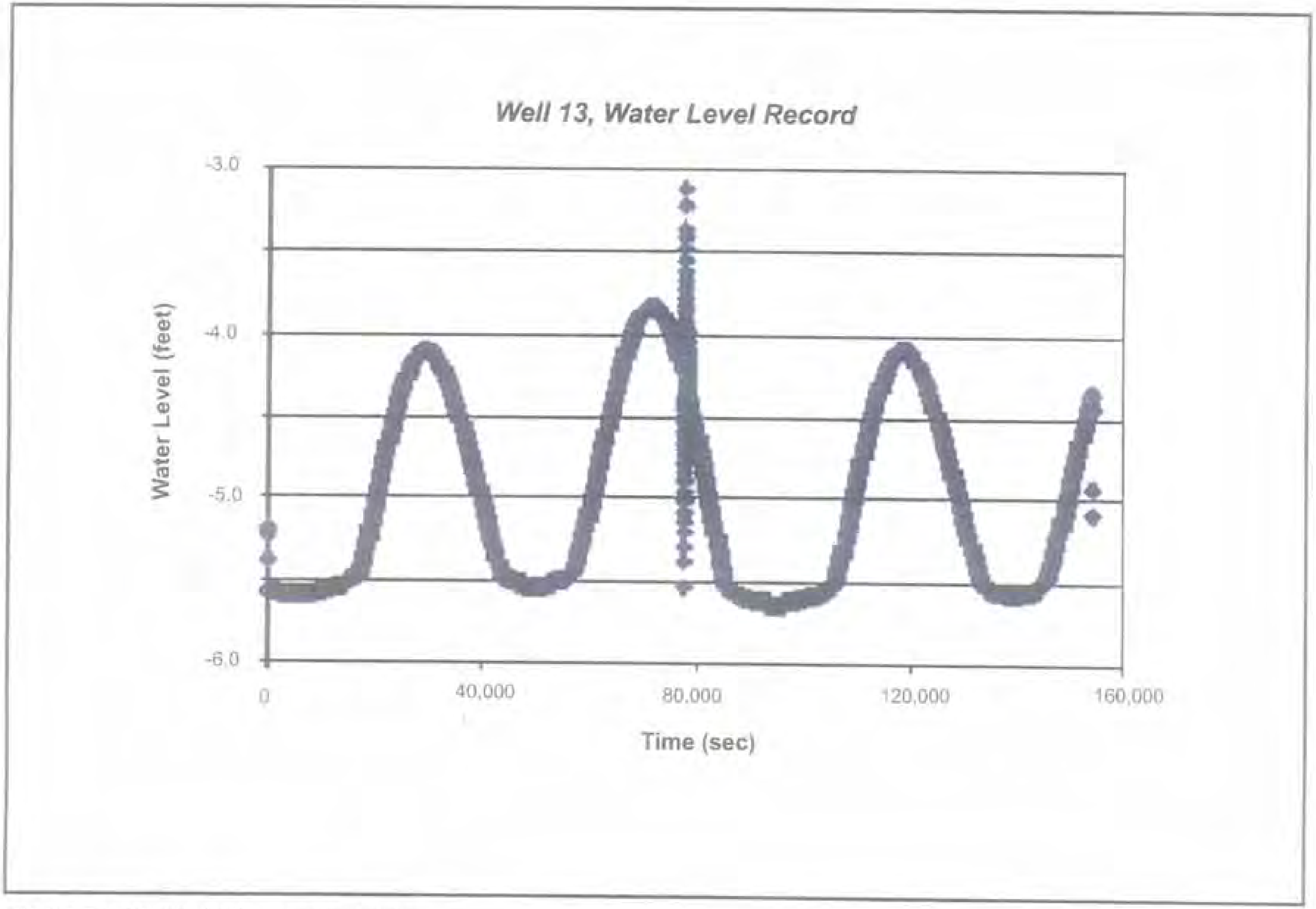

FIGURE A-17. Well 13 water level data.

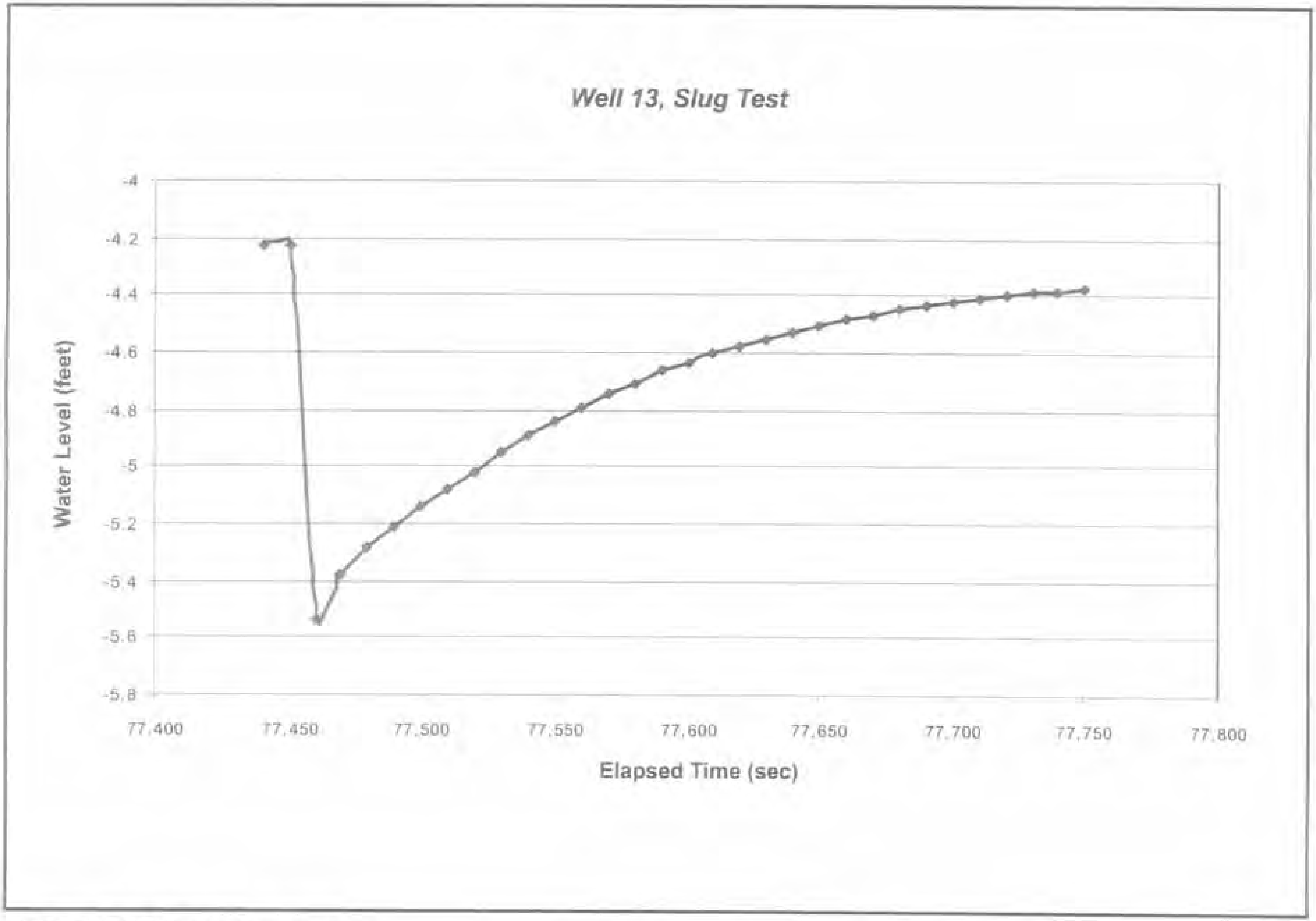

FIGURE A-18. Well 18 slug test data.

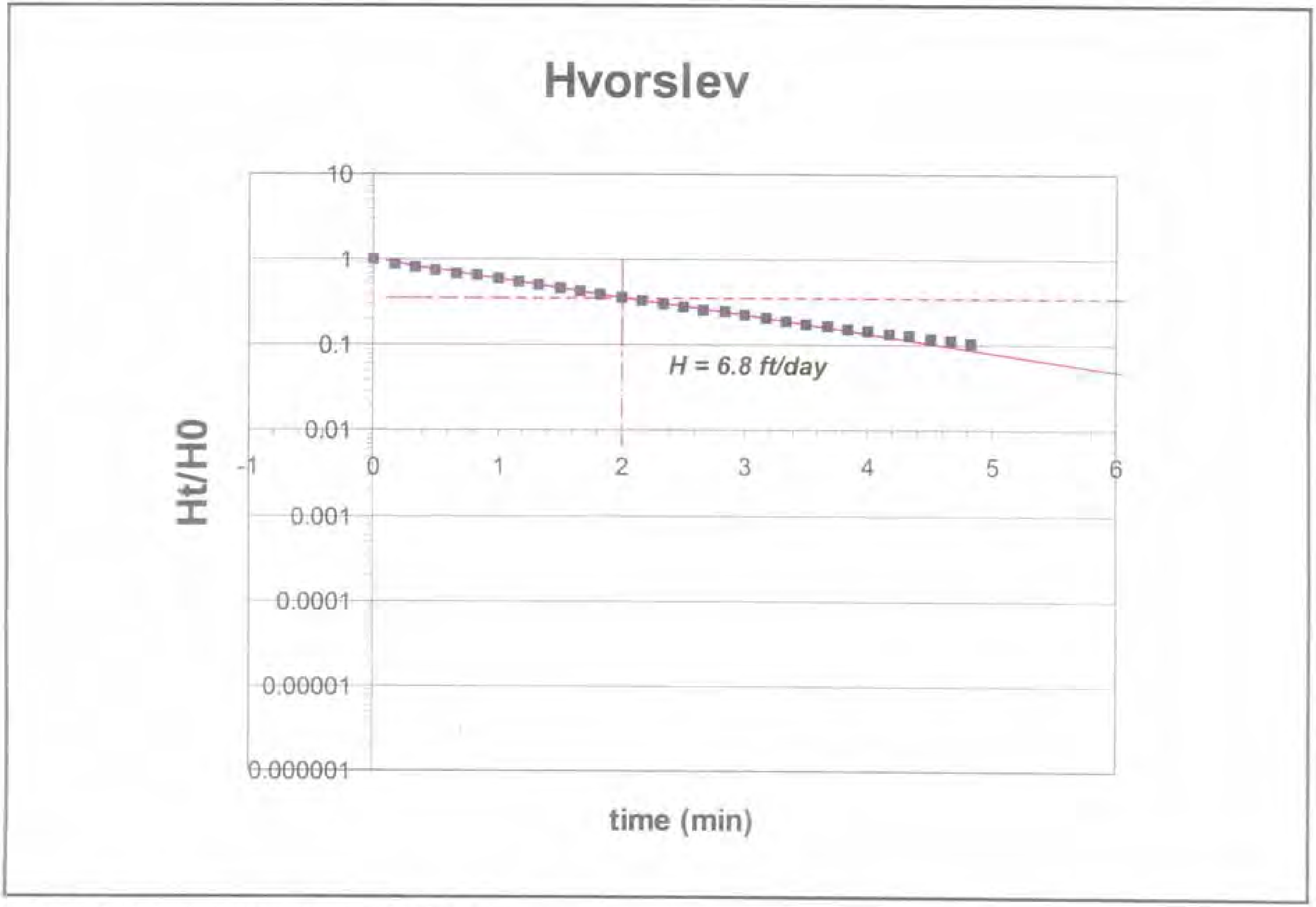

FIGURE A-19. Well 13 slug test, Hvorslev Analysis.

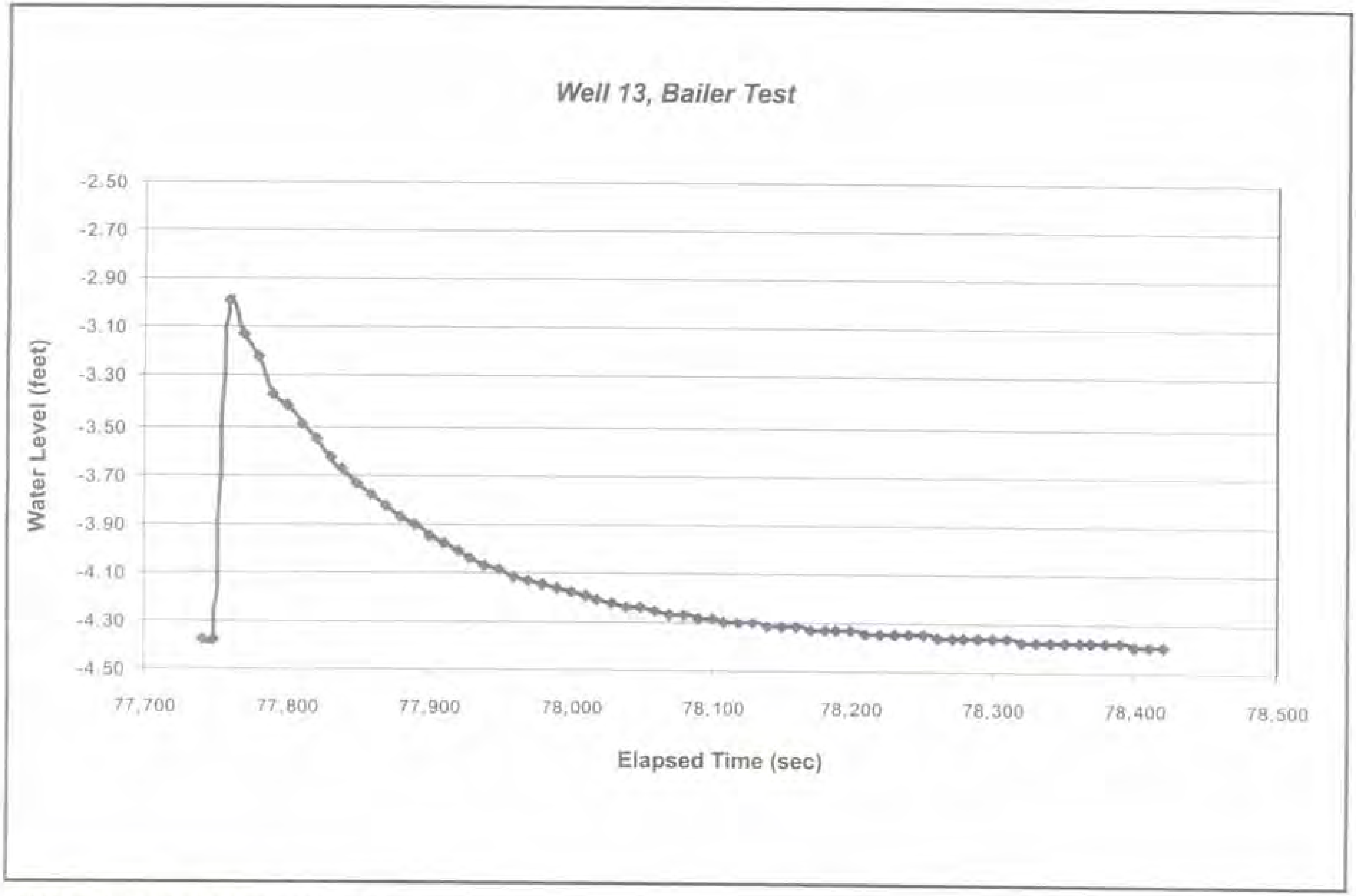

FIGURE A-20. Well 13 bailer test data.

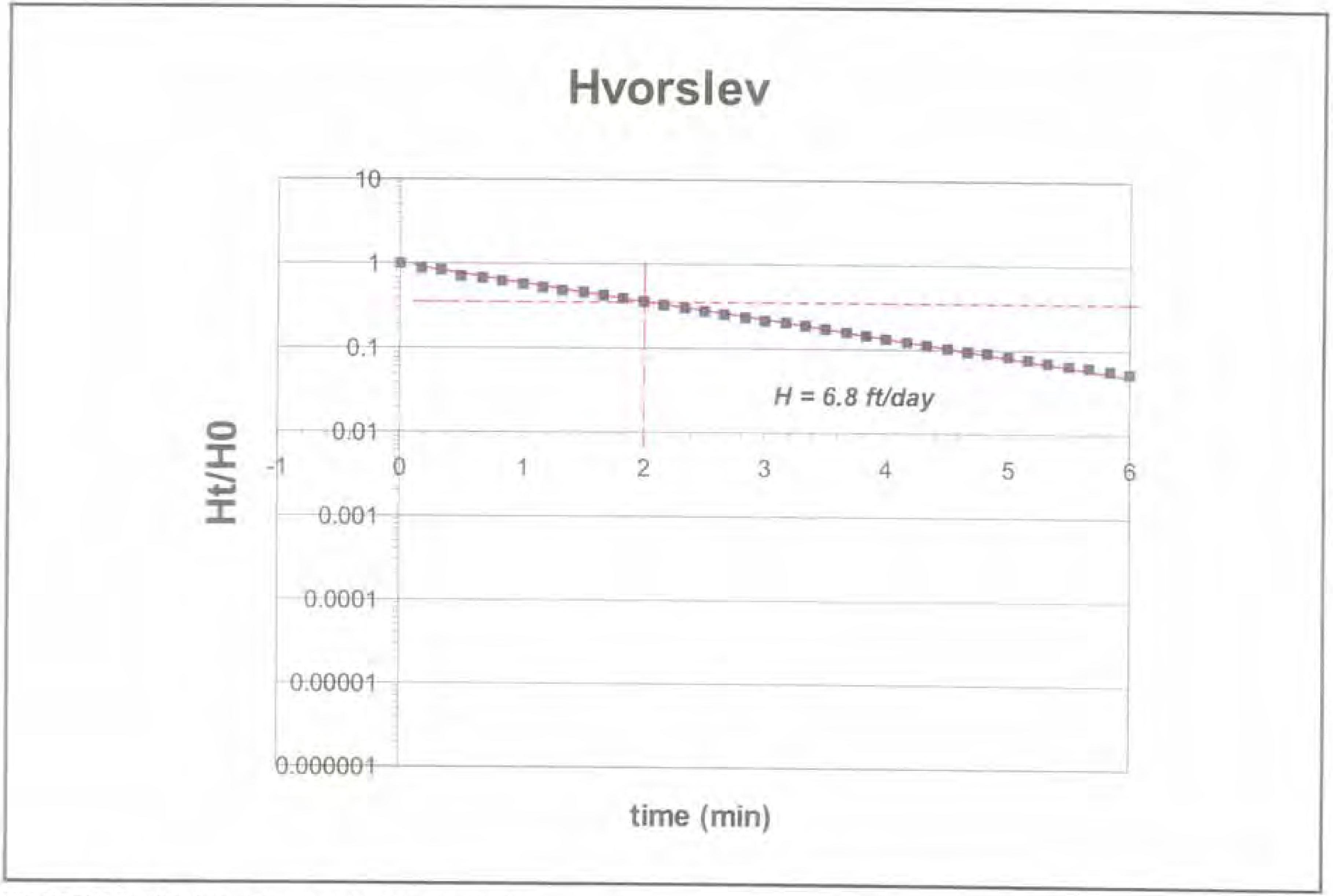

FIGURE A-21. Well 13 bailer test, Hvorslev Analysis.

Appendix B

Monitoring Well Data

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (μS/cm)	Temperature (°C)	Salinity (ppt)
1	0.00	0.75	1	2089	24.8	1.1
			2	2089	24.8	1.1
			3	2089	24.8	1.1
			4	2089	24.8	1.1
			5	2089	24.6	1.1
			10	2020	24.7	1.0
			11	2020	24.7	1.0
			12	2020	24.7	1.0
			13	2020	24.7	1.0
			14	2020	24.7	1.0
			15	1946	24.8	1.0
			16	1946	24.8	1.0
			17	1946	24.8	1.0
			18	1946	24.8	1.0
			19	1946	24.8	1.0
			20	1884	24.9	1.0
			21	1884	24.9	1.0
			22	1884	24.9	1.0
			23	1884	24.9	1.0
			24	1884	24.9	1.0
			25	1834	25.0	0.9
			26	1834	25.0	0.9
			27	1834	25.0	0.9
			28	1834	25.0	0.9
			29	1384	25.0	0.7
2	0.00	1.50	2	1550	25.2	0.8
			3	1550	25.2	0.8
			4	1550	25.2	0.8
			5	1544	24.4	0.8
			6	1544	24.4	0.8
			7	1544	24.4	0.8
			8	1544	24.4	0.8
			9	1544	24.4	0.8
			10	1584	24.1	0.8

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (◦C)	Salinity (ppt)
			11	1584	24.1	0.8
			12	1597	24.1	0.8
			13	1597	24.1	0.8
			14	1597	24.1	0.8
			15	1602	24.1	0.8
			16	1602	24.1	0.8
			17	1602	24.1	0.8
			18	1602	24.1	0.8
			19	1602	24.1	0.8
			20	1598	24.2	0.8
			21	1598	24.2	0.8
			22	1598	24.2	0.8
			23	1598	24.2	0.8
			24	1598	24.2	0.8
			25	1592	24.2	0.8
			26	1592	24.2	0.8
			27	1592	24.2	0.8
			28	1592	24.2	0.8
			29.75	1577	24.2	0.8
3	0.00	4.00	5	191	23.3	0.1
			6	191	23.3	0.1
			7	191	23.3	0.1
			8	191	23.2	0.1
			9	191	23.2	0.1
			10	185.5	23.3	0.1
			11	185.5	23.3	0.1
			12	185.5	23.3	0.1
			13	185.5	23.3	0.1
			14	185.5	23.3	0.1
			15	174.4	23.4	0.1
			16	174.4	23.4	0.1
			17	174.4	23.4	0.1
			18	174.4	23.4	0.1
			19	174.4	23.4	0.1

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (◦C)	Salinity (ppt)
			20	164.8	23.6	0.1
			21	164.8	23.6	0.1
			22	164.8	23.6	0.1
			23	164.8	23.6	0.1
			24	164.8	23.6	0.1
			25	160.4	23.6	0.1
			26	160.4	23.6	0.1
			27	160.4	23.6	0.1
			28	160.4	23.6	0.1
			29	194.5	23.7	0.1
4	0.00	4.00	5	552	23.2	0.3
			6	552	23.2	0.3
			7	552	23.2	0.3
			8	552	23.2	0.3
			9	552	23.2	0.3
			10	541	23.2	0.3
			11	541	23.2	0.3
			12	541	23.2	0.3
			13	541	23.2	0.3
			14	541	23.2	0.3
			15	524	23.3	0.3
			16	519	23.4	0.3
			17	519	23.4	0.3
			18	515	23.5	0.2
			19	515	23.5	0.2
			20	514	23.5	0.2
			21	518	23.5	0.3
			22	570	23.5	0.3
			23	628	23.6	0.3
			24	760	23.6	0.4
			25	782	23.6	0.4
			26	887	23.6	0.5
			27	1210	23.7	0.6
			28	1327	23.7	0.7

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (μS/cm)	Temperature (°C)	Salinity (ppt)
5	0.00	2.67	3	748	24.3	0.4
			4	748	24.3	0.4
			5	748	24.3	0.4
			6	748	24.3	0.4
			7	748	24.3	0.4
			8	748	24.3	0.4
			9	748	24.3	0.4
			10	752	24.6	0.4
			11	752	24.6	0.4
			12	752	24.6	0.4
			13	752	24.6	0.4
			14	752	24.6	0.4
			15	773	24.7	0.4
			16	793	24.8	0.4
			17	793	24.8	0.4
			18	793	24.8	0.4
			19	793	24.8	0.4
			20	850	24.9	0.4
			21	850	24.9	0.4
			22	900	24.9	0.4
			23	900	24.9	0.4
			24	900	24.9	0.4
			25	1001	24.9	0.5
			26	1001	24.9	0.5
			27	1001	24.9	0.5
			28	1001	24.9	0.5
			29.25	1074	24.9	0.5
6	0.00	2.00	3	781	24.3	0.4
			4	781	24.3	0.4
			5	781	24.3	0.4
			6	781	24.3	0.4
			7	781	24.3	0.4
			8	781	24.3	0.4
			9	781	24.3	0.4

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (μS/cm)	Temperature (◦C)	Salinity (ppt)
			10	771	24.5	0.4
			11	771	24.5	0.4
			12	771	24.5	0.4
			13	771	24.5	0.4
			14	771	24.5	0.4
			15	759	24.6	0.4
			16	756	24.7	0.4
			17	756	24.7	0.4
			18	756	24.7	0.4
			19	756	24.7	0.4
			20	750	24.8	0.4
			21	750	24.8	0.4
			22	750	24.8	0.4
			23	750	24.8	0.4
			24	750	24.8	0.4
			25	750	24.8	0.4
			26	750	24.8	0.4
			27	750	24.8	0.4
			28	750	24.8	0.4
			29.75	753	24.8	0.4
7	0.00	10.42	11	575	24.4	0.3
			12	579	24.4	0.3
			13	579	24.4	0.3
			14	579	24.4	0.3
			15	636	24.4	0.3
			16	673	24.5	0.3
			17	690	24.5	0.3
			18	705	24.5	0.3
			19	735	24.5	0.4
			20	743	24.5	0.4
			21	763	24.6	0.4
			22	781	24.6	0.4
			23	789	24.6	0.4
			24	811	24.6	0.4

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (◦C)	Salinity (ppt)
			25	862	24.6	0.4
			26	964	24.6	0.5
			27	1030	24.6	0.5
			28	1248	24.5	0.6
8	0.00	9.75	10	2727	23.9	1.4
			11	3521	24.1	1.9
			12	3638	24.1	1.9
			13	3793	24.1	2.0
			14	3846	24.1	2.0
			15	4005	24.2	2.1
			17	4143	24.2	2.2
			18	4301	24.3	2.3
			19	4337	24.3	2.3
			20	4418	24.3	2.4
			21	4418	24.3	2.4
			22	4549	24.3	2.4
			23	4754	24.3	2.5
			24	4801	24.3	2.6
			25	4852	24.3	2.6
			26	4875	24.3	2.6
			27	4906	24.3	2.6
			28	5650	24.4	3.0
9	0.00	3.00	4	826	24.4	0.4
			5	826	24.4	0.4
			6	826	24.4	0.4
			7	873	24.3	0.4
			8	873	24.3	0.4
			9	873	24.3	0.4
			10	849	24.2	0.4
			11	849	24.2	0.4
			12	849	24.2	0.4
			13	849	24.2	0.4
			14	849	24.2	0.4
			15	815	24.2	0.4

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (°C)	Salinity (ppt)
			16	815	24.2	0.4
			17	815	24.2	0.4
			18	801	24.2	0.4
			19	801	24.2	0.4
			20	782	24.2	0.4
			21	782	24.2	0.4
			22	782	24.2	0.4
			23	782	24.2	0.4
			24	761	24.2	0.4
			25	761	24.2	0.4
			26	756	24.2	0.4
			27	756	24.2	0.4
			28	751	24.2	0.4
			29	744	24.2	0.4
10	0.00	12.25	13	1368	25.1	0.7
			14	1384	25.1	0.7
			15	1398	25.1	0.7
			16	1398	25.1	0.7
			17	1543	25.1	0.8
			18	1543	25.1	0.8
			19	1710	25.1	0.9
			20	1903	25.1	1.0
			21	1903	25.1	1.0
			22	1903	25.1	1.0
			23	1903	25.1	1.0
			24	2096	25.1	1.1
			25	2096	25.1	1.1
			26	2355	25.1	1.2
			27	2595	25.0	1.3
			28	2786	24.9	1.4
			29	2711	24.9	1.4
11	0.00	4.50	5	567	23.7	0.3
			6	567	23.7	0.3

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (μS/cm)	Temperature (°C)	Salinity (ppt)
			7	567	23.7	0.3
			8	567	23.7	0.3
			9	567	23.7	0.3
			10	554	23.8	0.3
			11	551	23.8	0.3
			12	551	23.8	0.3
			13	551	23.8	0.3
			14	551	23.8	0.3
			15	529	23.8	0.3
			16	523	23.9	0.3
			17	523	23.9	0.3
			18	516	23.9	0.3
			19	507	23.9	0.2
			20	497	23.9	0.2
			21	495	24.0	0.2
			22	486	24.0	0.2
			23	486	24.0	0.2
			24	486	24.0	0.2
			25	472	24.0	0.2
			26	472	24.0	0.2
			27	468	24.0	0.2
			28.33	468	24.1	0.2
12	0.00	4.00	5	435	23.7	0.2
			6	435	23.7	0.2
			7	435	23.7	0.2
			8	435	23.7	0.2
			9	435	23.7	0.2
			10	435	23.7	0.2
			11	435	23.7	0.2
			12	435	23.7	0.2
			13	435	23.7	0.2
			14	435	23.7	0.2
			15	435	23.7	0.2
			16	435	23.7	0.2

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (◦C)	Salinity (ppt)
			17	435	23.7	0.2
			18	435	23.7	0.2
			19	435	23.7	0.2
			20	392	23.7	0.2
			21	392	23.7	0.2
			22	392	23.7	0.2
			23	392	23.7	0.2
			24	392	23.7	0.2
			25	392	23.7	0.2
			26	392	23.7	0.2
			27	392	23.7	0.2
			28.67	372	23.7	0.2

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (μS/cm)	Temperature (°C)	Salinity (ppt)
1	0.00	0.75	1	2089	24.8	1.1
			2	2089	24.8	1.1
			3	2089	24.8	1.1
			4	2089	24.8	1.1
			5	2089	24.6	1.1
			10	2020	24.7	1.0
			11	2020	24.7	1.0
			12	2020	24.7	1.0
			13	2020	24.7	1.0
			14	2020	24.7	1.0
			15	1946	24.8	1.0
			16	1946	24.8	1.0
			17	1946	24.8	1.0
			18	1946	24.8	1.0
			19	1946	24.8	1.0
			20	1884	24.9	1.0
			21	1884	24.9	1.0
			22	1884	24.9	1.0
			23	1884	24.9	1.0
			24	1884	24.9	1.0
			25	1834	25.0	0.9
			26	1834	25.0	0.9
			27	1834	25.0	0.9
			28	1834	25.0	0.9
			29	1384	25.0	0.7
2	0.00	1.50	2	1550	25.2	0.8
			3	1550	25.2	0.8
			4	1550	25.2	0.8
			5	1544	24.4	0.8
			6	1544	24.4	0.8
			7	1544	24.4	0.8
			8	1544	24.4	0.8
			9	1544	24.4	0.8
			10	1584	24.1	0.8

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (μS/cm)	Temperature (◦C)	Salinity (ppt)
			11	1584	24.1	0.8
			12	1597	24.1	0.8
			13	1597	24.1	0.8
			14	1597	24.1	0.8
			15	1602	24.1	0.8
			16	1602	24.1	0.8
			17	1602	24.1	0.8
			18	1602	24.1	0.8
			19	1602	24.1	0.8
			20	1598	24.2	0.8
			21	1598	24.2	0.8
			22	1598	24.2	0.8
			23	1598	24.2	0.8
			24	1598	24.2	0.8
			25	1592	24.2	0.8
			26	1592	24.2	0.8
			27	1592	24.2	0.8
			28	1592	24.2	0.8
			29.75	1577	24.2	0.8
3	0.00	4.00	5	191	23.3	0.1
			6	191	23.3	0.1
			7	191	23.3	0.1
			8	191	23.2	0.1
			9	191	23.2	0.1
			10	185.5	23.3	0.1
			11	185.5	23.3	0.1
			12	185.5	23.3	0.1
			13	185.5	23.3	0.1
			14	185.5	23.3	0.1
			15	174.4	23.4	0.1
			16	174.4	23.4	0.1
			17	174.4	23.4	0.1
			18	174.4	23.4	0.1
			19	174.4	23.4	0.1

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (◦C)	Salinity (ppt)
			20	164.8	23.6	0.1
			21	164.8	23.6	0.1
			22	164.8	23.6	0.1
			23	164.8	23.6	0.1
			24	164.8	23.6	0.1
			25	160.4	23.6	0.1
			26	160.4	23.6	0.1
			27	160.4	23.6	0.1
			28	160.4	23.6	0.1
			29	194.5	23.7	0.1
4	0.00	4.00	5	552	23.2	0.3
			6	552	23.2	0.3
			7	552	23.2	0.3
			8	552	23.2	0.3
			9	552	23.2	0.3
			10	541	23.2	0.3
			11	541	23.2	0.3
			12	541	23.2	0.3
			13	541	23.2	0.3
			14	541	23.2	0.3
			15	524	23.3	0.3
			16	519	23.4	0.3
			17	519	23.4	0.3
			18	515	23.5	0.2
			19	515	23.5	0.2
			20	514	23.5	0.2
			21	518	23.5	0.3
			22	570	23.5	0.3
			23	628	23.6	0.3
			24	760	23.6	0.4
			25	782	23.6	0.4
			26	887	23.6	0.5
			27	1210	23.7	0.6
			28	1327	23.7	0.7

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (μS/cm)	Temperature (°C)	Salinity (ppt)
5	0.00	2.67	3	748	24.3	0.4
			4	748	24.3	0.4
			5	748	24.3	0.4
			6	748	24.3	0.4
			7	748	24.3	0.4
			8	748	24.3	0.4
			9	748	24.3	0.4
			10	752	24.6	0.4
			11	752	24.6	0.4
			12	752	24.6	0.4
			13	752	24.6	0.4
			14	752	24.6	0.4
			15	773	24.7	0.4
			16	793	24.8	0.4
			17	793	24.8	0.4
			18	793	24.8	0.4
			19	793	24.8	0.4
			20	850	24.9	0.4
			21	850	24.9	0.4
			22	900	24.9	0.4
			23	900	24.9	0.4
			24	900	24.9	0.4
			25	1001	24.9	0.5
			26	1001	24.9	0.5
			27	1001	24.9	0.5
			28	1001	24.9	0.5
			29.25	1074	24.9	0.5
6	0.00	2.00	3	781	24.3	0.4
			4	781	24.3	0.4
			5	781	24.3	0.4
			6	781	24.3	0.4
			7	781	24.3	0.4
			8	781	24.3	0.4
			9	781	24.3	0.4

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (◦C)	Salinity (ppt)
			10	771	24.5	0.4
			11	771	24.5	0.4
			12	771	24.5	0.4
			13	771	24.5	0.4
			14	771	24.5	0.4
			15	759	24.6	0.4
			16	756	24.7	0.4
			17	756	24.7	0.4
			18	756	24.7	0.4
			19	756	24.7	0.4
			20	750	24.8	0.4
			21	750	24.8	0.4
			22	750	24.8	0.4
			23	750	24.8	0.4
			24	750	24.8	0.4
			25	750	24.8	0.4
			26	750	24.8	0.4
			27	750	24.8	0.4
			28	750	24.8	0.4
			29.75	753	24.8	0.4
7	0.00	10.42	11	575	24.4	0.3
			12	579	24.4	0.3
			13	579	24.4	0.3
			14	579	24.4	0.3
			15	636	24.4	0.3
			16	673	24.5	0.3
			17	690	24.5	0.3
			18	705	24.5	0.3
			19	735	24.5	0.4
			20	743	24.5	0.4
			21	763	24.6	0.4
			22	781	24.6	0.4
			23	789	24.6	0.4
			24	811	24.6	0.4

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (◦C)	Salinity (ppt)
			25	862	24.6	0.4
			26	964	24.6	0.5
			27	1030	24.6	0.5
			28	1248	24.5	0.6
8	0.00	9.75	10	2727	23.9	1.4
			11	3521	24.1	1.9
			12	3638	24.1	1.9
			13	3793	24.1	2.0
			14	3846	24.1	2.0
			15	4005	24.2	2.1
			17	4143	24.2	2.2
			18	4301	24.3	2.3
			19	4337	24.3	2.3
			20	4418	24.3	2.4
			21	4418	24.3	2.4
			22	4549	24.3	2.4
			23	4754	24.3	2.5
			24	4801	24.3	2.6
			25	4852	24.3	2.6
			26	4875	24.3	2.6
			27	4906	24.3	2.6
			28	5650	24.4	3.0
9	0.00	3.00	4	826	24.4	0.4
			5	826	24.4	0.4
			6	826	24.4	0.4
			7	873	24.3	0.4
			8	873	24.3	0.4
			9	873	24.3	0.4
			10	849	24.2	0.4
			11	849	24.2	0.4
			12	849	24.2	0.4
			13	849	24.2	0.4
			14	849	24.2	0.4
			15	815	24.2	0.4

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (°C)	Salinity (ppt)
			16	815	24.2	0.4
			17	815	24.2	0.4
			18	801	24.2	0.4
			19	801	24.2	0.4
			20	782	24.2	0.4
			21	782	24.2	0.4
			22	782	24.2	0.4
			23	782	24.2	0.4
			24	761	24.2	0.4
			25	761	24.2	0.4
			26	756	24.2	0.4
			27	756	24.2	0.4
			28	751	24.2	0.4
			29	744	24.2	0.4
10	0.00	12.25	13	1368	25.1	0.7
			14	1384	25.1	0.7
			15	1398	25.1	0.7
			16	1398	25.1	0.7
			17	1543	25.1	0.8
			18	1543	25.1	0.8
			19	1710	25.1	0.9
			20	1903	25.1	1.0
			21	1903	25.1	1.0
			22	1903	25.1	1.0
			23	1903	25.1	1.0
			24	2096	25.1	1.1
			25	2096	25.1	1.1
			26	2355	25.1	1.2
			27	2595	25.0	1.3
			28	2786	24.9	1.4
			29	2711	24.9	1.4
11	0.00	4.50	5	567	23.7	0.3
			6	567	23.7	0.3

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (◦C)	Salinity (ppt)
			7	567	23.7	0.3
			8	567	23.7	0.3
			9	567	23.7	0.3
			10	554	23.8	0.3
			11	551	23.8	0.3
			12	551	23.8	0.3
			13	551	23.8	0.3
			14	551	23.8	0.3
			15	529	23.8	0.3
			16	523	23.9	0.3
			17	523	23.9	0.3
			18	516	23.9	0.3
			19	507	23.9	0.2
			20	497	23.9	0.2
			21	495	24.0	0.2
			22	486	24.0	0.2
			23	486	24.0	0.2
			24	486	24.0	0.2
			25	472	24.0	0.2
			26	472	24.0	0.2
			27	468	24.0	0.2
			28.33	468	24.1	0.2
12	0.00	4.00	5	435	23.7	0.2
			6	435	23.7	0.2
			7	435	23.7	0.2
			8	435	23.7	0.2
			9	435	23.7	0.2
			10	435	23.7	0.2
			11	435	23.7	0.2
			12	435	23.7	0.2
			13	435	23.7	0.2
			14	435	23.7	0.2
			15	435	23.7	0.2
			16	435	23.7	0.2

NPDC TEST WELLS

Well No.	Height of Casing ft)	Water Level (ft)	Depth (ft)	E.C. (µS/cm)	Temperature (◦C)	Salinity (ppt)
			17	435	23.7	0.2
			18	435	23.7	0.2
			19	435	23.7	0.2
			20	392	23.7	0.2
			21	392	23.7	0.2
			22	392	23.7	0.2
			23	392	23.7	0.2
			24	392	23.7	0.2
			25	392	23.7	0.2
			26	392	23.7	0.2
			27	392	23.7	0.2
			28.67	372	23.7	0.2

Appendix C

Groundwater Modeling Report

Technical Memorandum Report

Albany House Development Site and Surrounding Lands, New Providence Island, Bahamas

Groundwater Modeling

July 2005

Prepared by:
Waterloo Hydrogeologic, Inc.
A Schlumberger Company

Prepared for:
Missimer Groundwater Science, Inc.

waterloo hydrogeologic
SOFTWARE · CONSULTING · TRAINING

August 11, 2005

Mr. Tom Missimer
Hydrogeologist, Ph.D., P.G
Missimer Groundwater Science, Inc.
3214 Mc Gregor Boulevard
Fort Myers, FL 33901

RE: Technical Memorandum Report for the Albany House Development Site and Surrounding Lands, New Providence Island, Bahamas - Groundwater Modeling

Dear Mr. Missimer,

We are pleased to submit our Technical Memorandum Report for this project. This report presents the development of the numerical groundwater model and modeling results.

Should you have any questions regarding the information provided herein, please contact us.

Sincerely,

Waterloo Hydrogeologic, Inc.

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1 Numerical Modeling Approach

The following section provides a description of the important hydrogeologic features of the New Providence Island, Bahamas as they relate to the development of the conceptual model. The conceptual geological model was used to guide development of the numerical model in a manner consistent with the geology and hydrogeology of the area.

1.1 Selection of an Appropriate Physical Model

The proposed marina development is located in the southwest portion of the island encompassed by the Tongue of the Ocean (North Atlantic Ocean). The geologic setting has been documented in previous reports, specifically the Andros Island and was used to complete the numerical model development.

Only sediments of the Lucayan Formation with a maximum thickness of 170 ft were used in the model. The Upper Pliocene Formation, which has a high conductivity and shows an almost immediate response to tidal fluctuations, was found to be a proper vertical delimitation of the model.

An unconfined (phreatic) aquifer with saturated layers was considered to be an appropriate concept to represent the groundwater system. Additionally steady density dependent flow and steady mass transport were taken into account as coupled processes. Material parameters were assigned according to the conceptual model developed in the draft report, Hall & Missimer (2005).

1.2 Hydrogeologic Setting

The freshwater lens occurrence and flow within the Proposed Albany Site Development is primarily controlled by

- Topography
- Depositional environment of the geologic units, which define porosity and hydraulic conductivity and
- Bouyancy due to fluid density differences. In coastal areas saltwater penetrates into the aquifer underlying the freshwater body, so called saltwater intrusion. A transition zone is developed between freshwater and saltwater bodies.

Precipitation is the primary source of recharge for the freshwater lens, which is the portion that infiltrates into the ground, and is not retained as soil moisture or discharged to surface water features as interflow or overland flow. Man made lakes or surface-water features do not act to recharge the aquifer.

1.3 Numerical Model

Numerical models are structured tools for integrating a multitude of data (e.g. lithologies, water levels, groundwater/surface water features, pumping) and conceptual ideas to understand groundwater flow paths and predict variations caused by changing conditions, or insight from new data about the system. Models are used throughout the world to evaluate groundwater systems and have been growing in their application since the 1970's. Applications have migrated from simplified models, where geologic complexities were grossly generalized, to more detailed models, which utilize all available data in an effort to represent the hydrogeologic system as accurately as possible.

In constructing the model, all available data (such as water level, hydraulic conductivities, hydrostratigraphic, topographic, and lithologic properties) were incorporated into the numerical model. The detailed conceptual understanding is critical to the development of a realistic numerical flow model.

Once constructed the model must be "calibrated" to observed field conditions to provide confidence that it is realistic. During the model calibration process, physical parameters are adjusted within acceptable field and literature derived ranges to produce a model that closely simulates the field conditions.

Recognizing the inherent geologic and hydrogeologic uncertainty of the complex natural system, multiple conceptualizations were evaluated to provide an upper and lower boundary to the flow system. This involved modeling scenarios that included, more layers, changing boundary conditions, changing from steady state flow to transport and finally density dependant flow.

1.4 Numerical Model Code Selection

Numerous modeling tools exist, each with inherent strengths and weaknesses. Therefore it is important to select a modeling tool that meets the objectives of a given study. The important considerations in selecting a modeling code for the New Providence Island include:

- Desire to represent both regional and local features in one integrated model and incorporate important features at both scales
- Maintain a freshwater lens that is representative of the hydrogeologic system within the Lucayan limestone
- Density dependent flow in a 3-dimensional model
- Convective formulation of the transport equation

FEFLOW was considered because of its advance capabilities to simulate complex groundwater flow systems involving density dependent conditions. A Galerkin based formulation was chosen as appropriate finite element method (FEM). Fluid viscosity dependencies were neglected.

The finite element method, which is employed in FEFLOW and other codes, addresses many of the shortcomings of the finite difference method and is often applied in more complex settings. The finite element method uses more sophisticated numerical solution algorithms resulting in more stable, faster solutions, which help modeling in complex geologic areas (Martin and Frind, 1998, Anderson and Woessner, 1992, WASY, 2003, Wang and Anderson, 1995). FEFLOW has been used to model complex groundwater systems worldwide by more than 200 leading research, consulting, and government organizations (WHI, 2003).

Given these considerations, FEFLOW (WASY, 2003) was selected to complete the groundwater modeling for the proposed Albany Marina. Since saltwater intrusion of the freshwater lens was the primary concern for this model, FEFLOW's enhanced capabilities to incorporate these features were considered necessary to develop a realistic modeling tool.

1.5 Model Domain

The location and extent of the model domain is shown on figure 1. Approximated lengths of the model domain are 5,997 feet (ft) in the East-West direction and 5,413 ft in the North-South direction. The model area covers approximately 32.5 E6 ft^2. The body has a volume of about 5.35 E9 ft^3.

The model domain was designed to encompass the proposed marina development and freshwater trench system just north of the site. Where natural flow boundaries exist, these were applied to the model layers.

A finite element mesh was developed for the model domain. As shown on Figure 2, the mesh is refined in areas where it is important to have enhanced definition of the freshwater lens.

In Figure 3 the locations of segments 1 and 2 are represented.

1.6 Model Layer Structure

The mesh is composed of 6 noded triangular prisms, which built a 3D structure. This structure has a total of 17 layers, 18 slices, 223193 elements and 120582 nodes. A 2D projection of the mesh represents a triangular irregular network, Figure 2.

The southern area comprising the marina was refined. As a result two thirds of the total projected area remained coarse.

The length of the triangle sides are less than 164 ft for the coarse and less than 114.8 ft for the refined area.

The shape of the marina was considered while designing the grid. The width of the marina is approx. 754.6 ft.

Table 1: Layer Thickness

Layer	Thickness (ft)	Integrated Thickness (ft)
1	10 – 20 (variable)	10 – 20 (variable)
2 + 3	5	10
4 - 17	10	140
Total Thickness	-	**160 – 170 (variable)**

1.7 Flow Parameters

Table 2 provides the hydraulic conductivity values used in the groundwater flow model. Hydraulic conductivity values are consistent with those cited in the draft report Hall & Missimer (2005) and in Whitaker & Smart (1997) and were adjusted by increasing and decreasing the values. Typically an anisotropy ratio for the horizontal to vertical hydraulic conductivity values of 10:1 was used. The density ratio value in all layers was estimated to be 0.025. A density of 164 lb/ft^3 for standard mean ocean water is taken into account.

Table 2: Hydraulic Conductivity Values used in the Models

Material	Hydraulic Conductivity Layers #	Horizontal Hydraulic Conductivity Value		Vertical Hydraulic Conductivity Value	
Limestone (Upper Lucayan Formation)	1 – 4	50 ft/d	1.76E-4 m/s	5 ft/d	1.76E-5 m/s
Limestone (Lower Lucayan Formation)	2 – 17	1000 ft/d	3.53E-3 m/s	100 ft/d	3.53E-4 m/s
Albany Marina	1 – 3 (local only)	2834645 ft/d	1 m/s	2834645 ft/d	1 m/s
Curtainwall	1 – 4 (local only)	2.83E-4 ft/d	1E-10 m/s	2.83E-4 ft/d	1E-10 m/s

Conductivity parameters were changed locally in the corresponding layers as shown in Figures 4 and 5 to mimic the Albany Marina and a curtainwall. Isotropic conditions were taken into account for the marina and the curtainwall.

1.8 Mass Transport Parameters

The following parameters for mass transport were implemented into the model:

Table 3: Mass Transport Parameters

Mass Transport Parameter	Value
Longitudinal Dispersivity	164 ft
Transversal Dispersivity	32.8 ft
Molecular diffusion	0.11 ft^2/s
Total Porosity	0.3 (and 1.0 for the marina only)

The free convection process for buoyancy driven transport is characterized in Diersch (2002a). In order to satisfy the Rayleigh criteria a high molecular diffusion was taken into account (Holzbecher, 1998).

1.9 Boundary Conditions

Boundary conditions represent the interaction between the model domain and the surrounding environment. The boundary conditions that were represented in the model include vertical recharge through the upper layer of the model and lateral outflow through the southern shoreline and to a certain extent through the southern surface of the model. A depth dependant reference potential (constant head boundary) was assigned corresponding to the different slices of the southern surface taking into consideration the density of the standard mean ocean water, Diersch (2002b). No-flow boundaries were assigned along the north, east and west extents of the model domain perpendicular to the inferred flow direction as well as to the model bottom.

A freshwater condition was set on top with a type-3 flux boundary condition. A value of 9.99 E-5 oz/ft^3 and a transfer rate of 2,460 ft/d were selected after testing a range of different values. The bottom (slice 18) and also the slices 2 to 17 of the southern boundary surface have a constant concentration boundary of 0.35 lb/gal of total dissolved solids. Along the shoreline a constant concentration boundary of 9.99 E-5 oz/ft^3 was maintained in slice 1. In order to allow a mass exit a constraint condition of mass boundaries was defined along the shoreline in slice1.

1.9.1 Recharge

The mean annual rainfall is 55.0 in/yr. The expected recharge value is considered to be 18 percent of the annual precipitation. Therefore 10.0 in/yr were considered as a reasonable recharge on top of the model.

1.9.2 Trench System

Although fresh water is extracted for water supply the trench system was not yet implemented in the model in this phase. The extraction value within the model area is not exactly known. It is recommended that when this information is obtained to include it into the model.

1.10 Model Calibration

The process of model calibration may be defined as the adjustment of the assigned model parameter values to match field measured values within a pre-established range of error described in more detail in the following sections. Measured values did not represent an appropriate data set for calibration. Thus the groundwater model of the study area was not calibrated to observations of hydraulic head in water wells. When this information is completed we recommend calibrating the model.

2 Numerical Model Results

2.1 Model Scenarios

Three different scenarios were calculated to assess the impact of the planned Albany Marina on the freshwater lens and the groundwater flow regime.

Table 4: Scenario concept

Scenario #	Name	Description
1	"Basic Scenario"	In the basic scenario the saltwater intrusion phenomenon is described. All boundaries needed for density dependent flow are defined here.
2	"Marina Scenario"	This scenario considers the proposed Albany Marina. The bottom of the marina is 20 ft below sea level and coincides with slice 4.
3	"Curtainwall Scenario	Beside the marina a curtainwall is taken into account. Includes the marina as described under scenario 2 and a curtainwall with a depth of 30 ft below sea level. The bottom of the curtainwall is on slice 5.

The computed scenarios allow an understanding of the system reaction after excavating the proposed marina and after building a planned curtainwall.

2.1.1 Convergence and Water Balance Calculations

Convergence was achieved within a few iterations (Figures 6 to 8) and numerical model settings demonstrated to represent a well posed problem.

2.1.2 Results

The following results are limited to the parameter and boundary settings as described earlier in this technical memorandum.

The "basic scenario" represents the natural and unaltered flow regime as revealed in Figures 9 and 10 for the heads. In Figure 11 the distribution of pressure and in Figure 12 the distribution of velocity are shown for segment 1. Figures 13, 14 and 15 illustrate the saltwater intrusion and transition zone in a fairly reasonable manner.

Strong and local change of the former distributions of heads and concentrations, occur in the "marina scenario" (Figures 16 through 19). Figure 20 shows in a pseudo 3D view the spatial changes of concentration. As it can be seen on Figure 21 the marina channel produces an effect of a drainage element increasing outflow velocities.

The distribution pattern for heads and concentrations for the "curtainwall scenario" is very similar to the corresponding distribution pattern of the "marina scenario", see Figures 22 to 25. In contrast to the "marina scenario" a minor difference in the head distribution can be noticed. At the place where the curtainwall is located the "curtainwall scenario" demonstrates a steeper loss of head. The influence on the concentration distribution is almost imperceptible. This prediction is supported by a pathline analysis illustrating the flow underneath the curtainwall, see Figure 26. As it can be seen in Figures 27 and 28 the curtainwall does not change the fact, that the marina still remains to be the main discharge area in the model.

All three scenarios are not meant to stand for a precise quantitative result. They suggest that the strongest impact is in the vertical and less in the lateral direction. Differences between two scenarios may well indicate performance contrasts of a planned construction activity. The following differences were calculated: "marina" minus "basic" and "curtainwall" minus "basic" scenario, Figures 29 and 30.

The expected lateral depletion of the fresh water lens appears to be small. This is supported by the extremely steep gradient developed towards the discharge boundary.

For the planned Albany Marina an influence radius of less than 300 ft for small changes in concentration (less than 0.5 mg/l) appear to be minor, (Figure 29). Figure 30 does not reveal any relevant improvement by implementing the curtainwall. The results of the current model show that the loss of freshwater on site is mainly due to sacrifice of recharge areas and storage volume rather than lateral depletion.

2.2 Recommendations

The building of a vertical curtainwall cannot be recommended as an effective measure to prevent the lateral depletion of the freshwater lens due to the construction of the proposed marina. This recommendation is valid as long as the Albany Marina lies outside from the catchment area of the trench system.

As already known, the planned marina will undoubtedly reduce the scarce freshwater resources. A re-location further south from the planned location to an already depleted area is not possible. Therefore compensation measures in protected recharge areas are recommended to counteract the loss of freshwater resources on the island of New Providence.

It is also recommended to implement the water extraction to the trenches into the model as data becomes available. Similarly we recommend that the model should be calibrated with an appropriate set of heads and concentrations.

3 References

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4 Figures

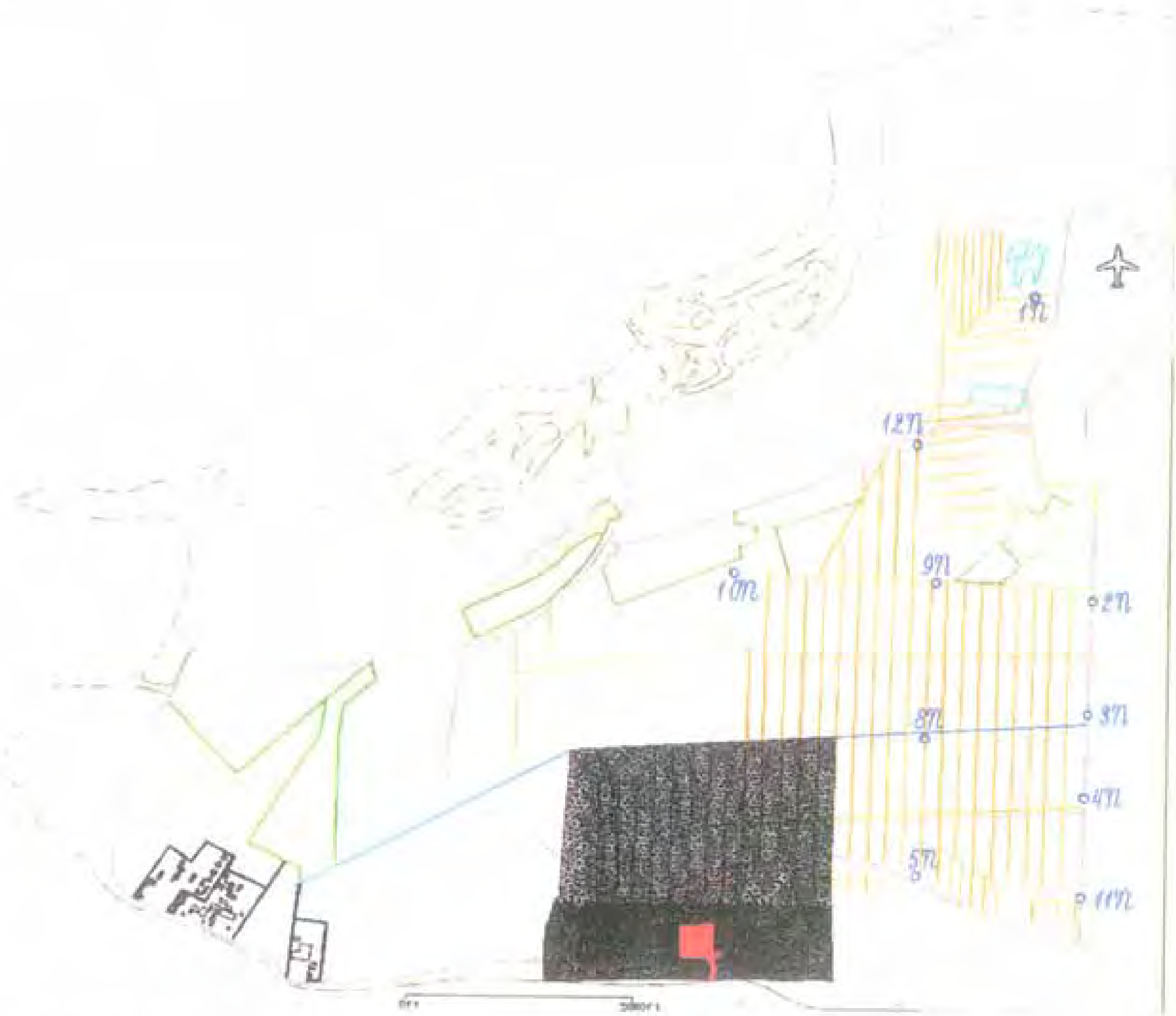


Figure 1: Model domain

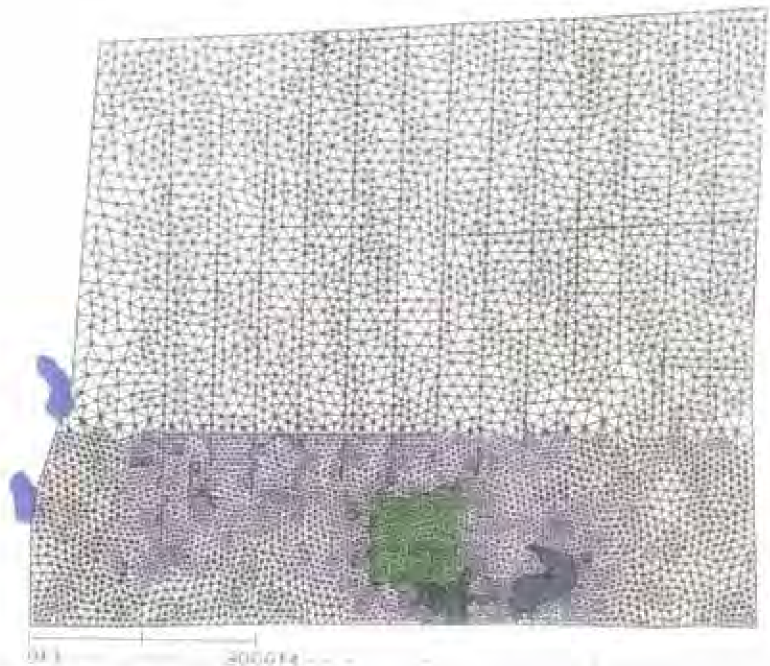


Figure 2: Model area with Albany Marina

Figure 3: Segments location

Figure 4: Conductivity distribution in m/s (Albany Marina with curtainwall, layer 1)

Figure 5: Conductivity distribution in m/s (Albany Marina with curtainwall, layer 4)

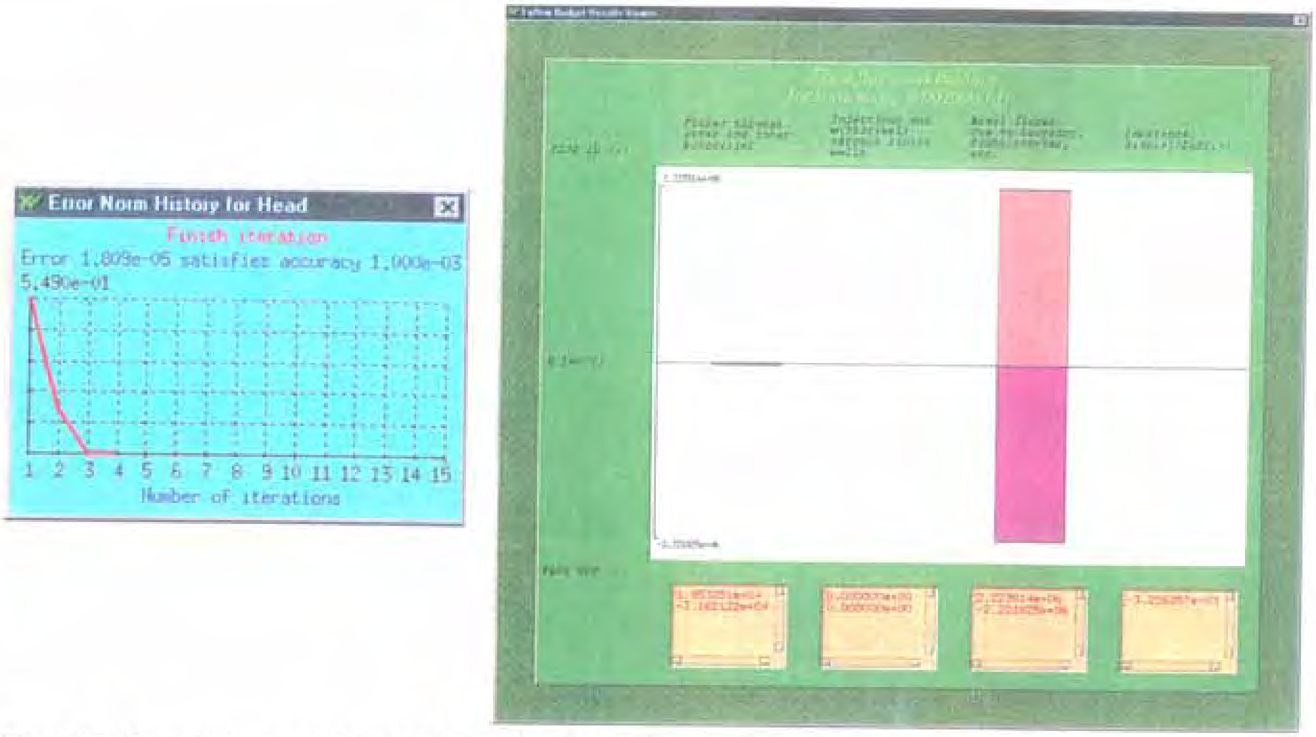


Figure 6: Convergence and water budget without Albany Marina

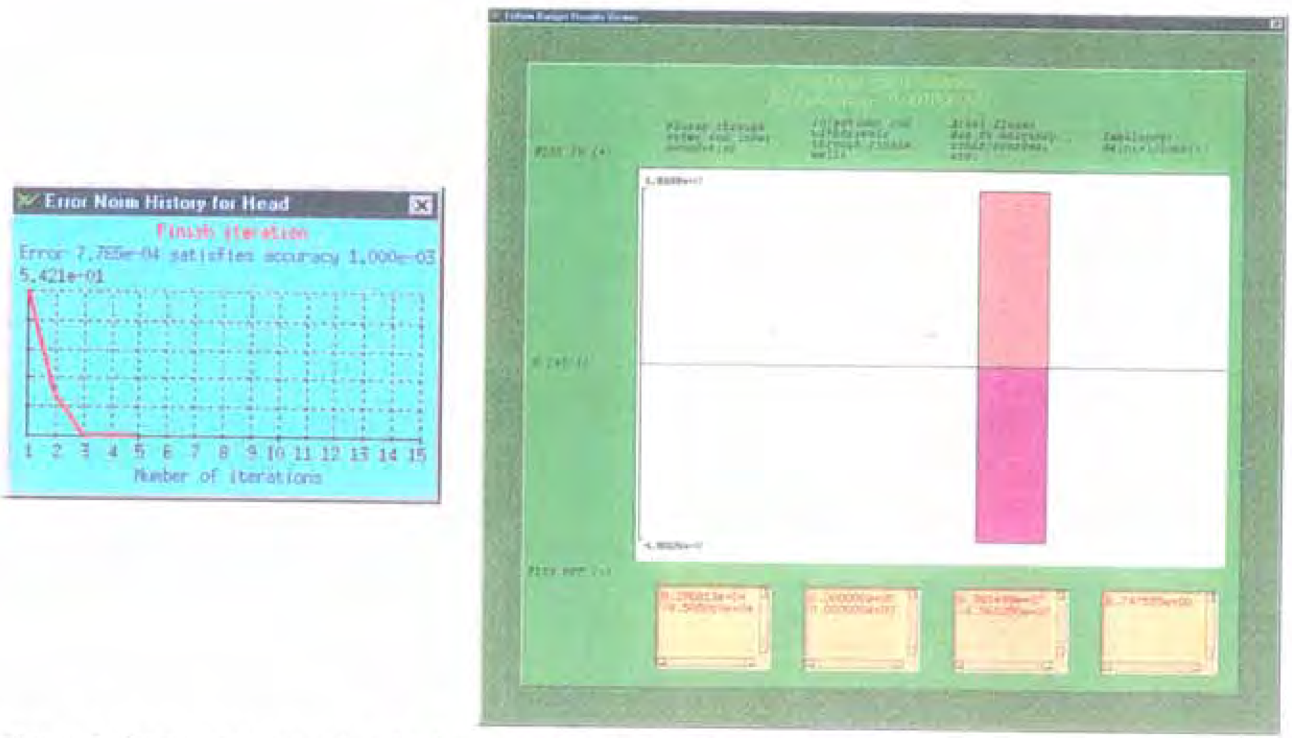


Figure 7: Convergence and water budget with Albany Marina

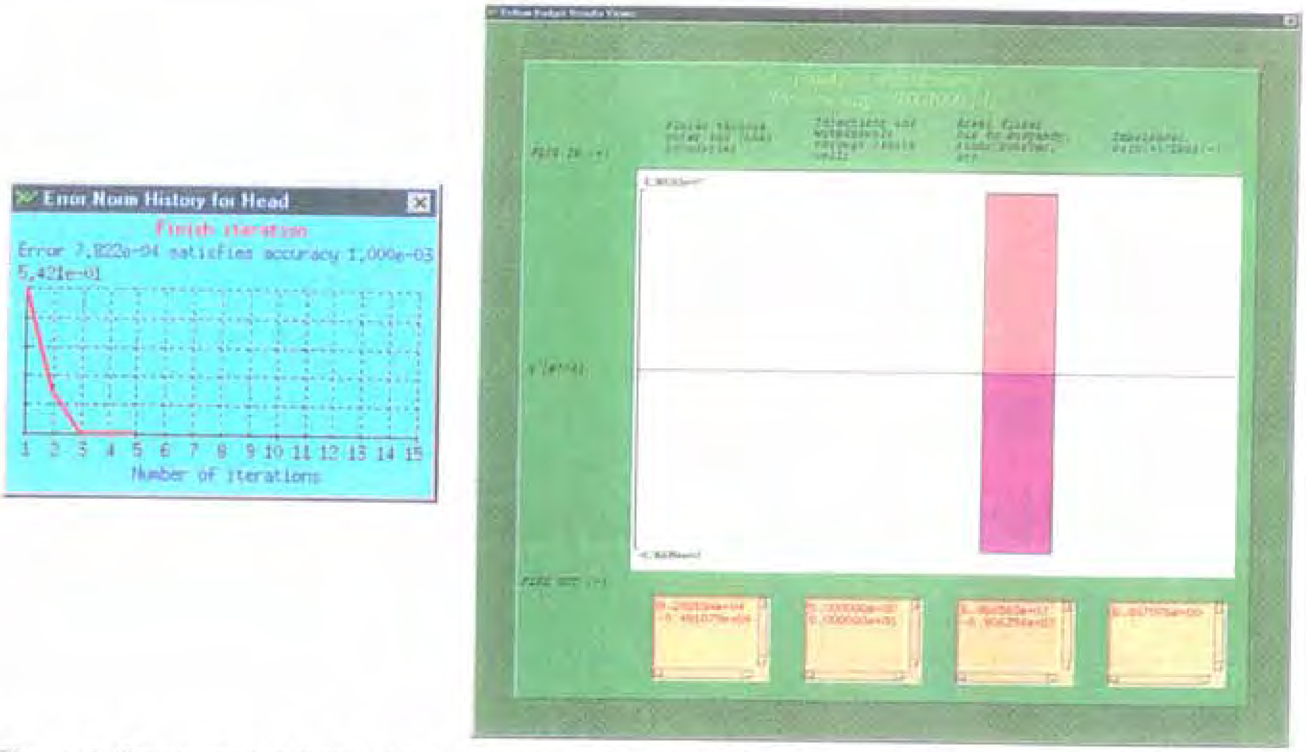


Figure 8: Convergence and water budget with Albany Marina and curtainwall

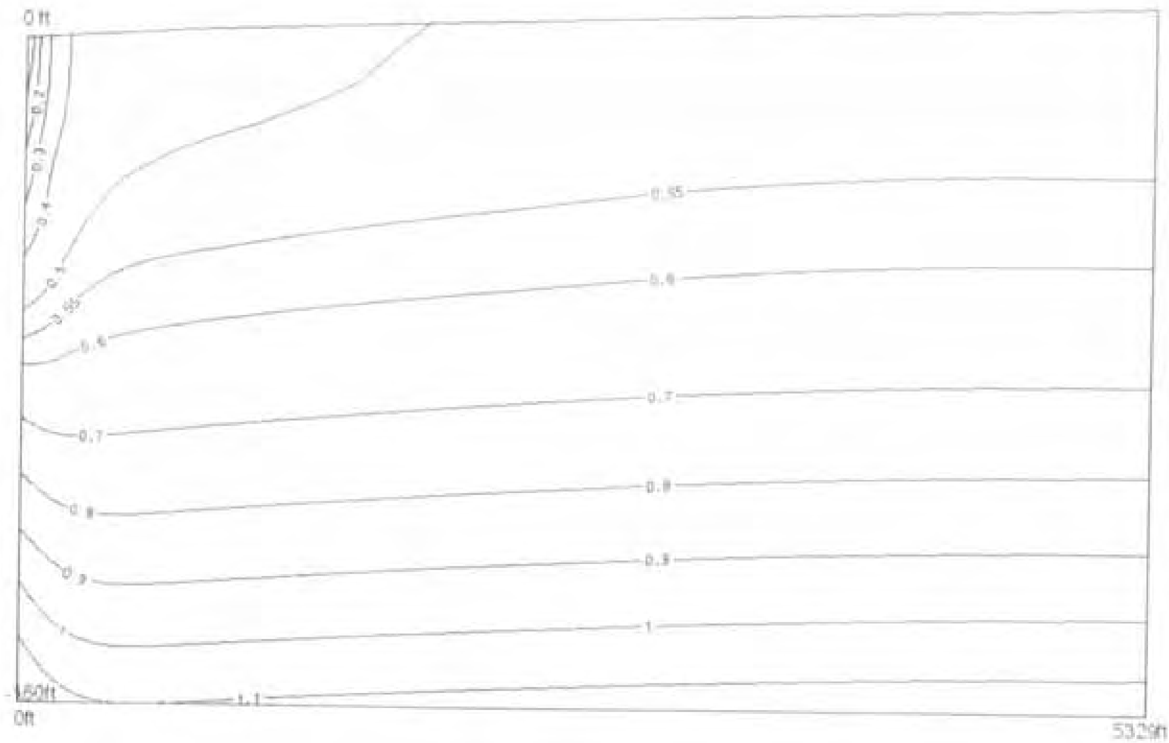


Figure 9: Distribution of heads in m (without Albany Marina, lines in segment 1, vertical exaggeration 20x)

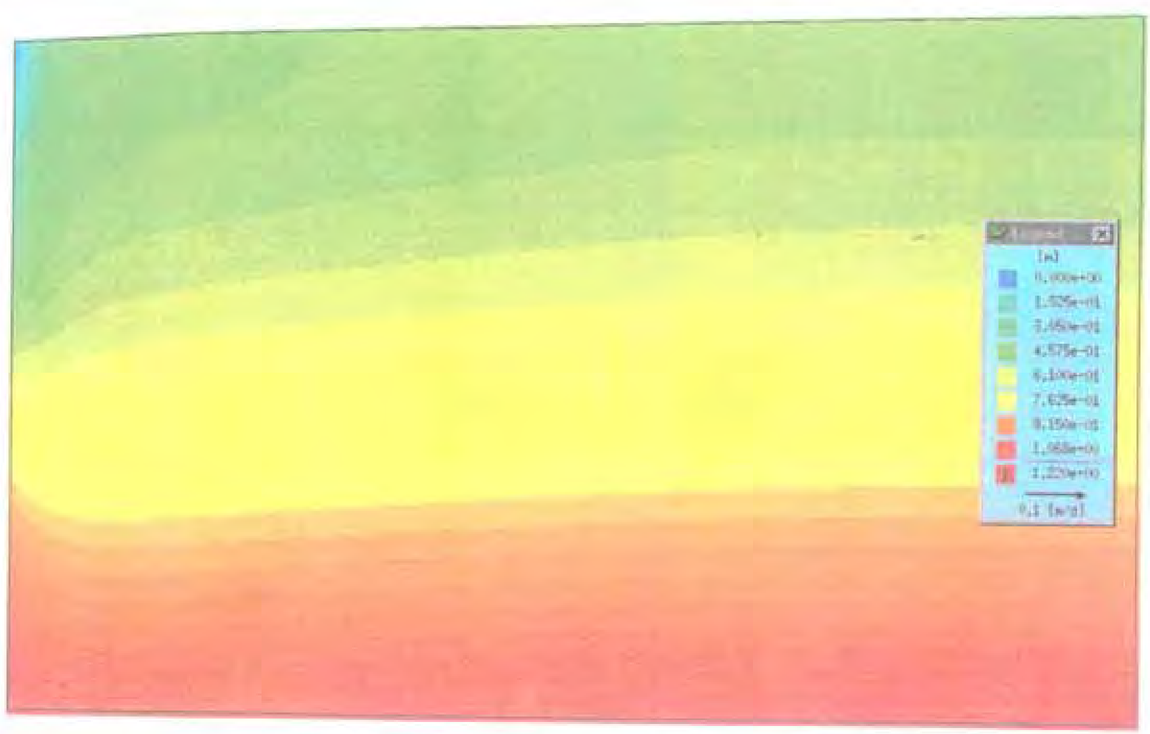


Figure 10: Distribution of heads in m (without Albany Marina, fringes in segment 1, vertical exaggeration 20x)

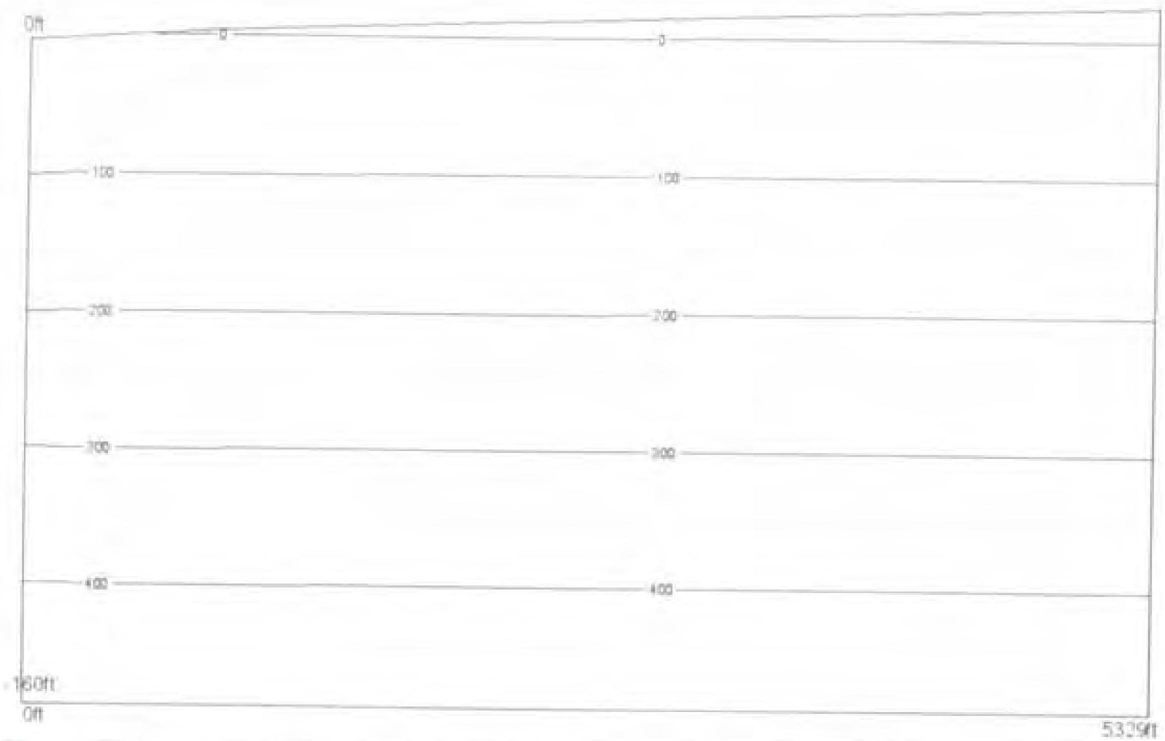


Figure 11 Pressure distribution in kPa (without Albany Marina, lines in segment 1, vertical exaggeration 20x)

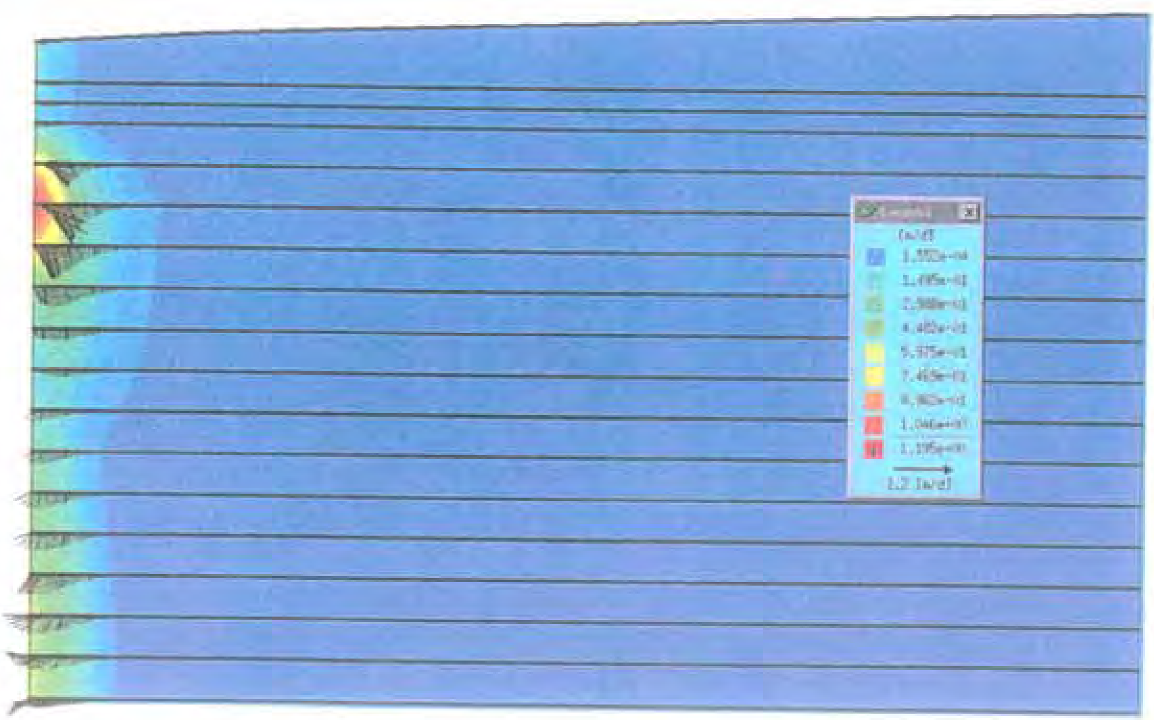


Figure 12 Velocity distribution in m/d (without Albany Marina, lines in segment 1, vertical exaggeration 20x). Horizontal lines show the 17 model layers

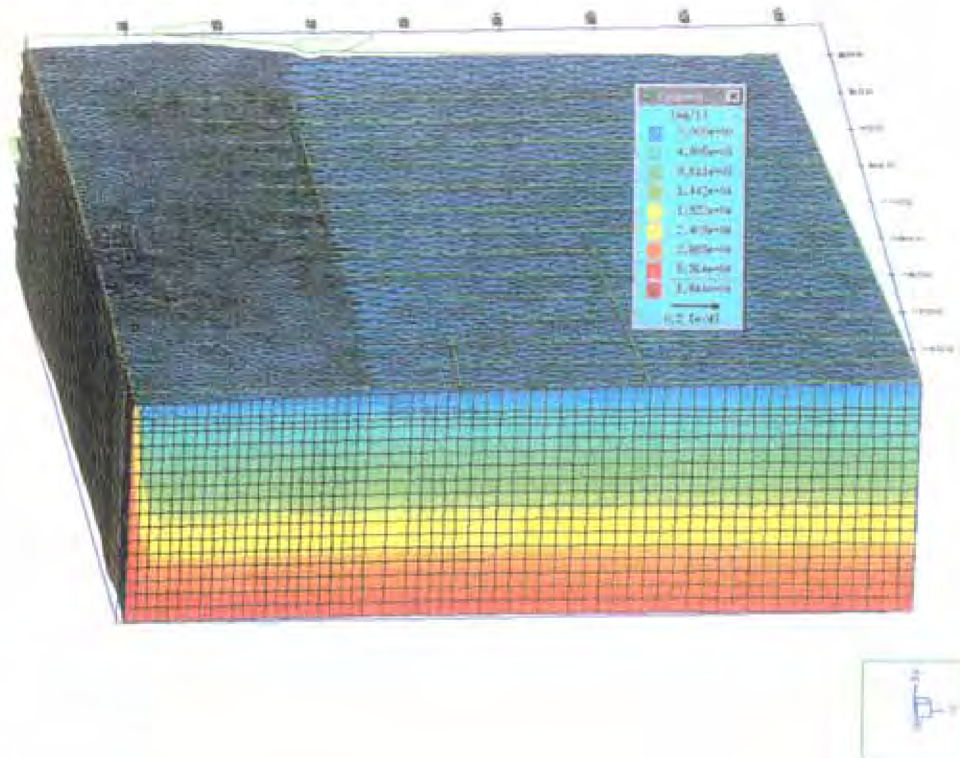


Figure 13: Saltwater Intrusion. Distribution of concentrations in mg/l (without Albany Marina, vertical exaggeration 10.5x)

Figure 14: Distribution of concentrations in mg/l (without Albany Marina, lines in segment 1, vertical exaggeration 20x)

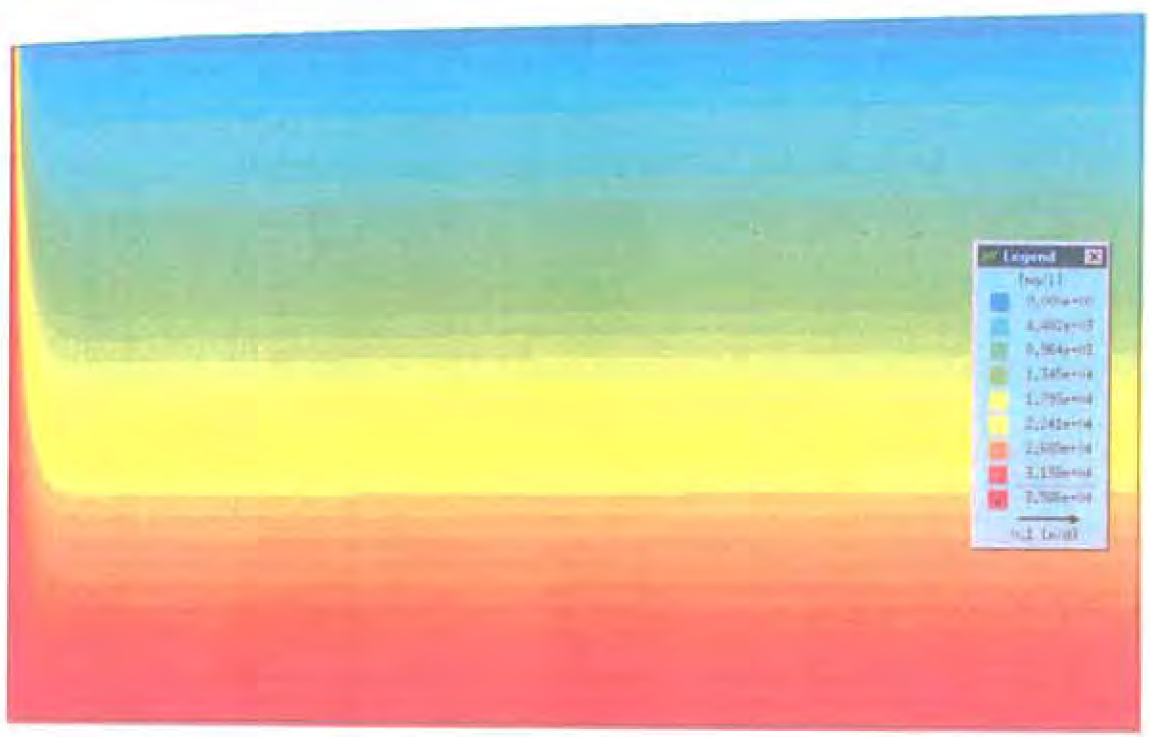


Figure 15: Distribution of concentrations in mg/l (without Albany Marina, fringes in segment 1, vertical exaggeration 20x)

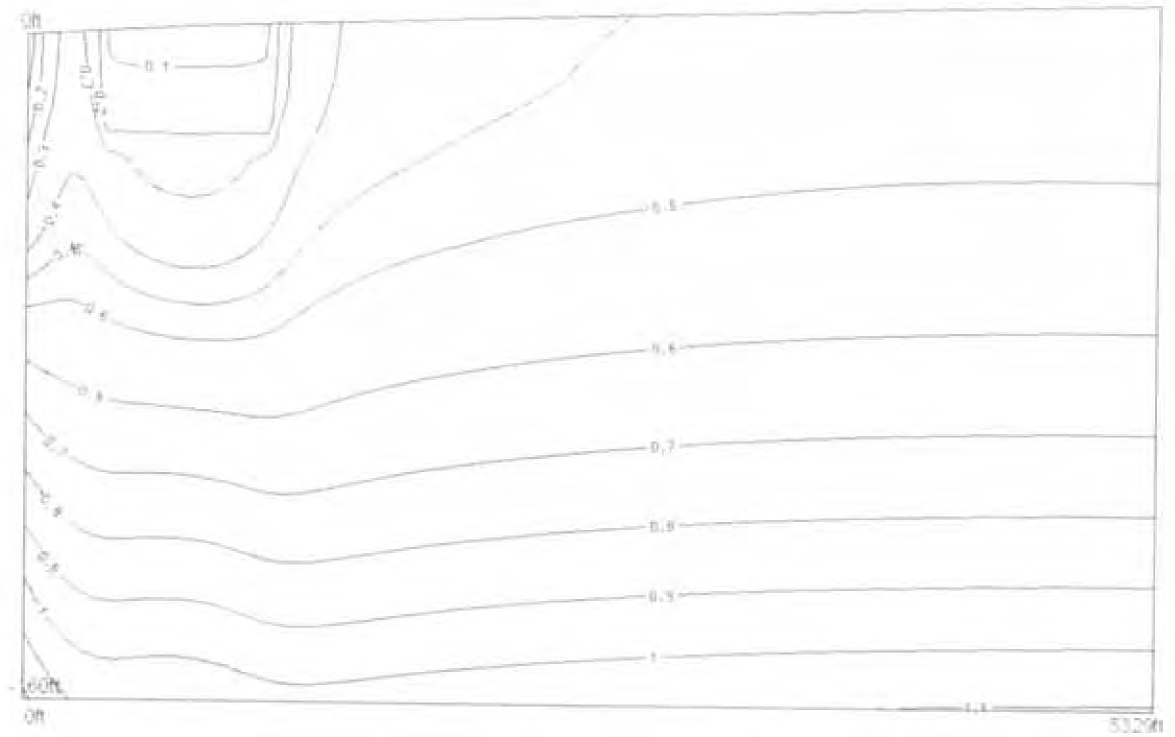


Figure 16: Distribution of heads in m (Albany Marina, lines in segment 1, vertical exaggeration 20x)

Figure 17: Distribution of heads in m (Albany Marina, fringes in segment 1, vertical exaggeration 20x)

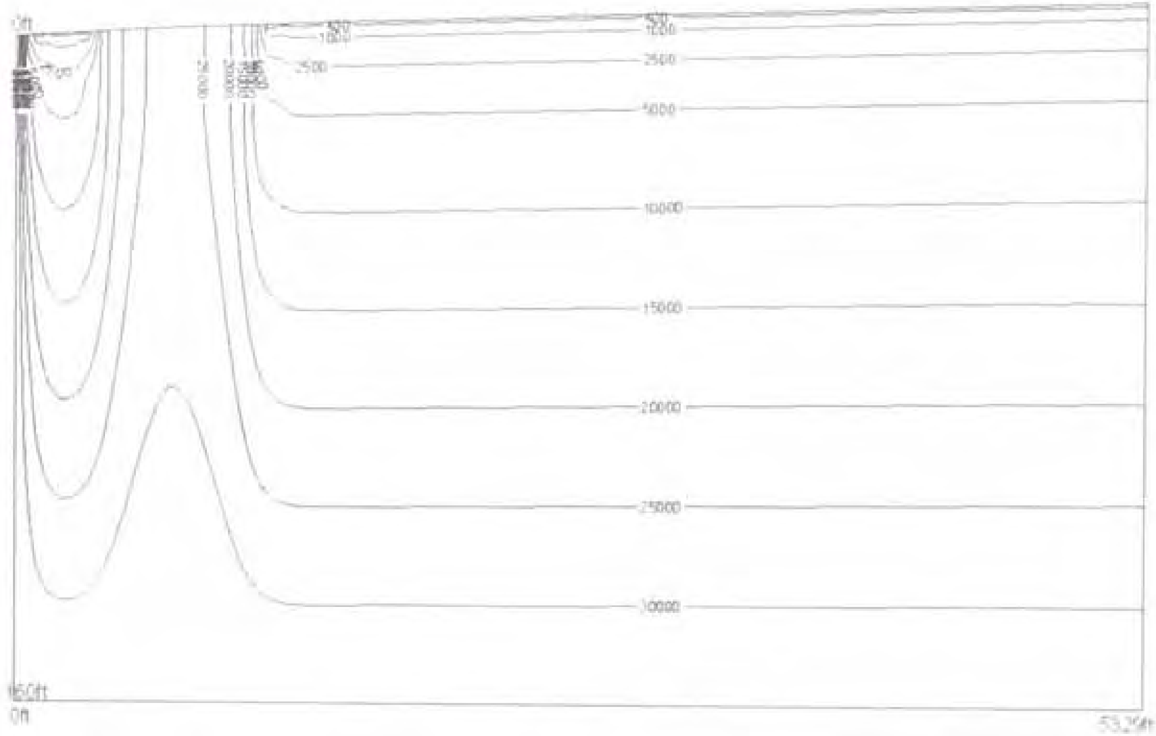


Figure 18: Distribution of concentrations in mg/l (Albany Marina, lines in segment 1, vertical exaggeration 20x)

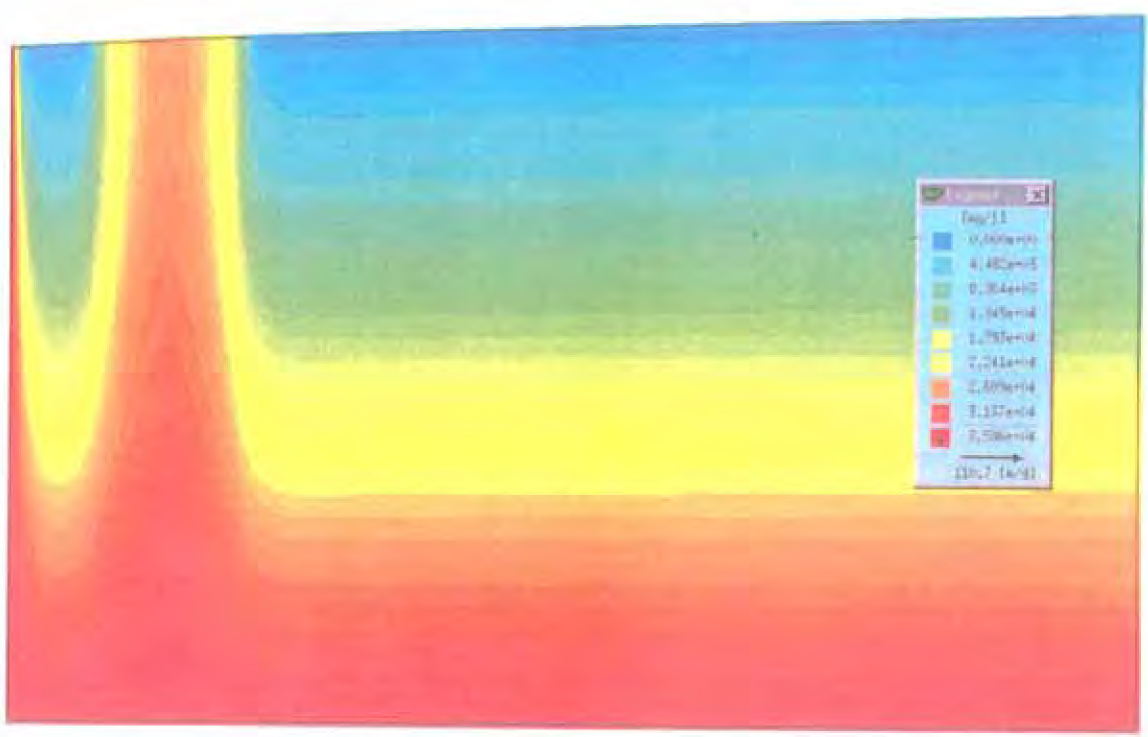


Figure 19: Distribution of concentrations in mg/l (Albany Marina, fringes in segment 1, vertical exaggeration 20x)

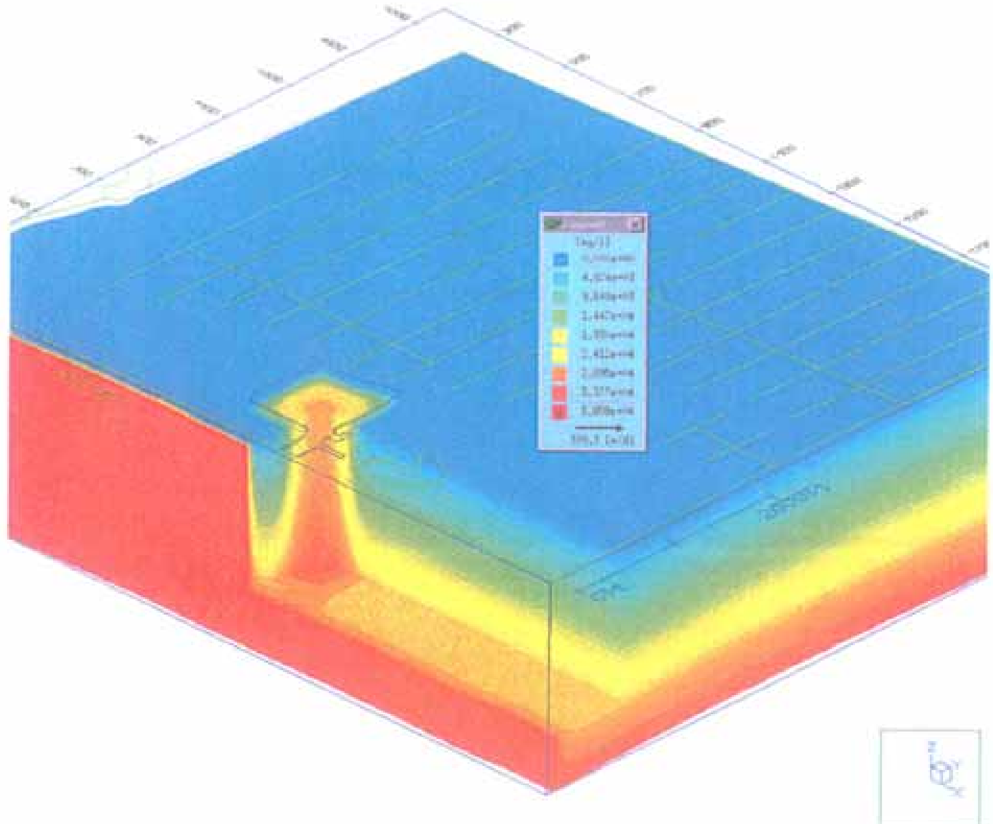


Figure 20: Distribution of concentrations in mg/l (Albany Marina, vertical exaggeration 10.5x)

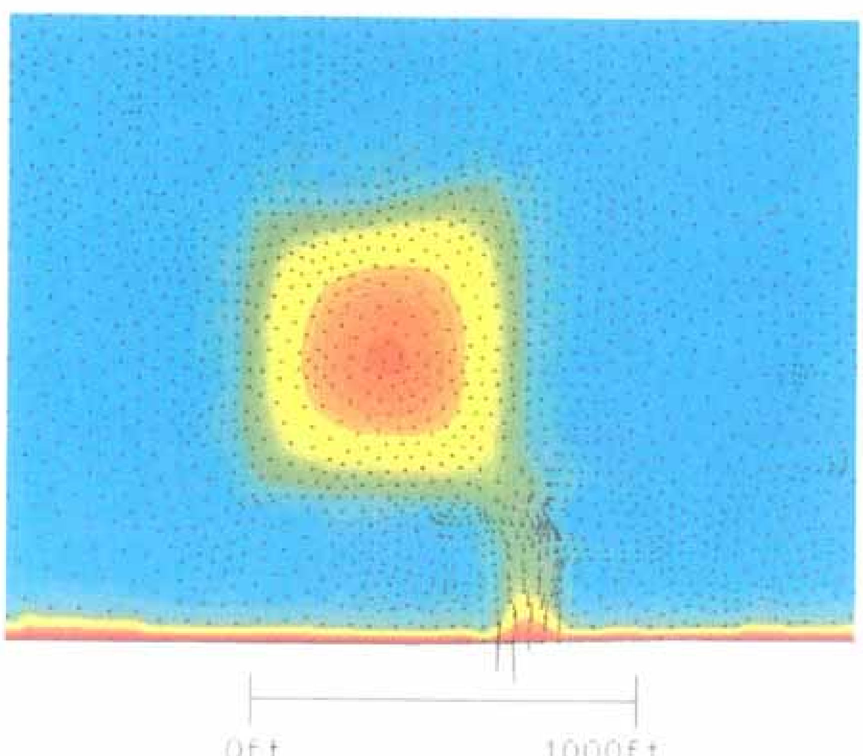


Figure 21: Distribution of concentrations in mg/l (Albany Marina, slice 2)

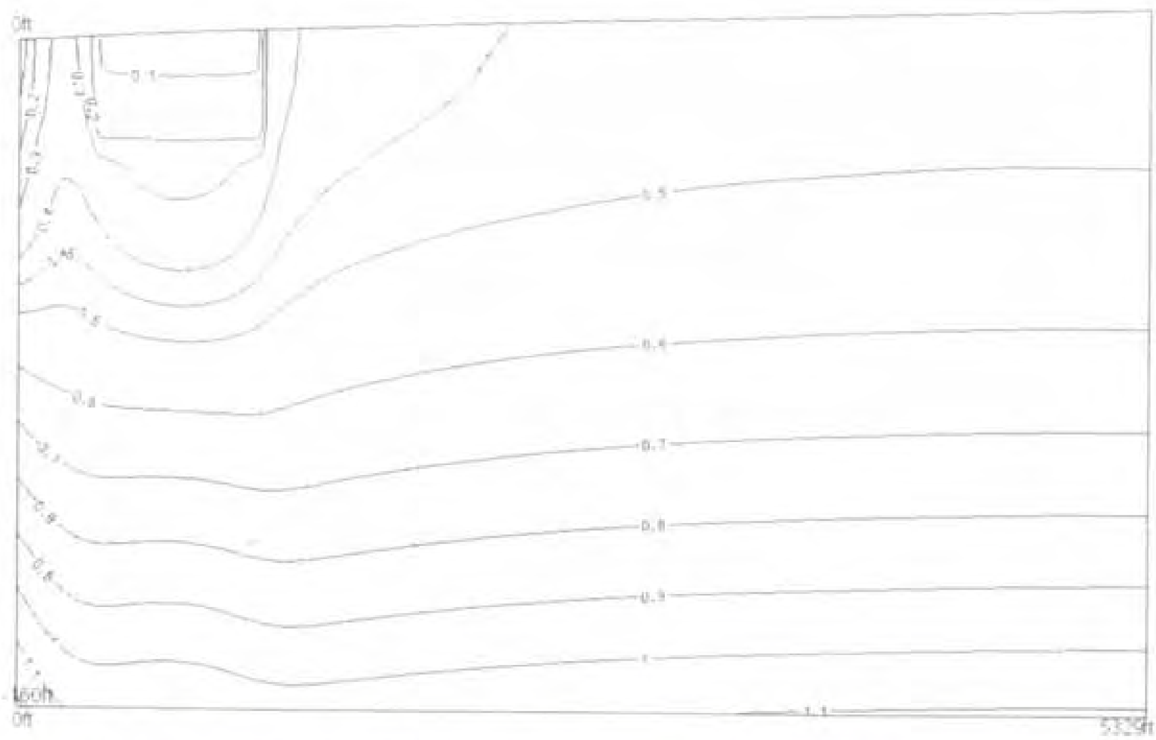


Figure 22: Distribution of heads in m (Albany Marina and curtainwall, lines in segment 1, vertical exaggeration 20x)

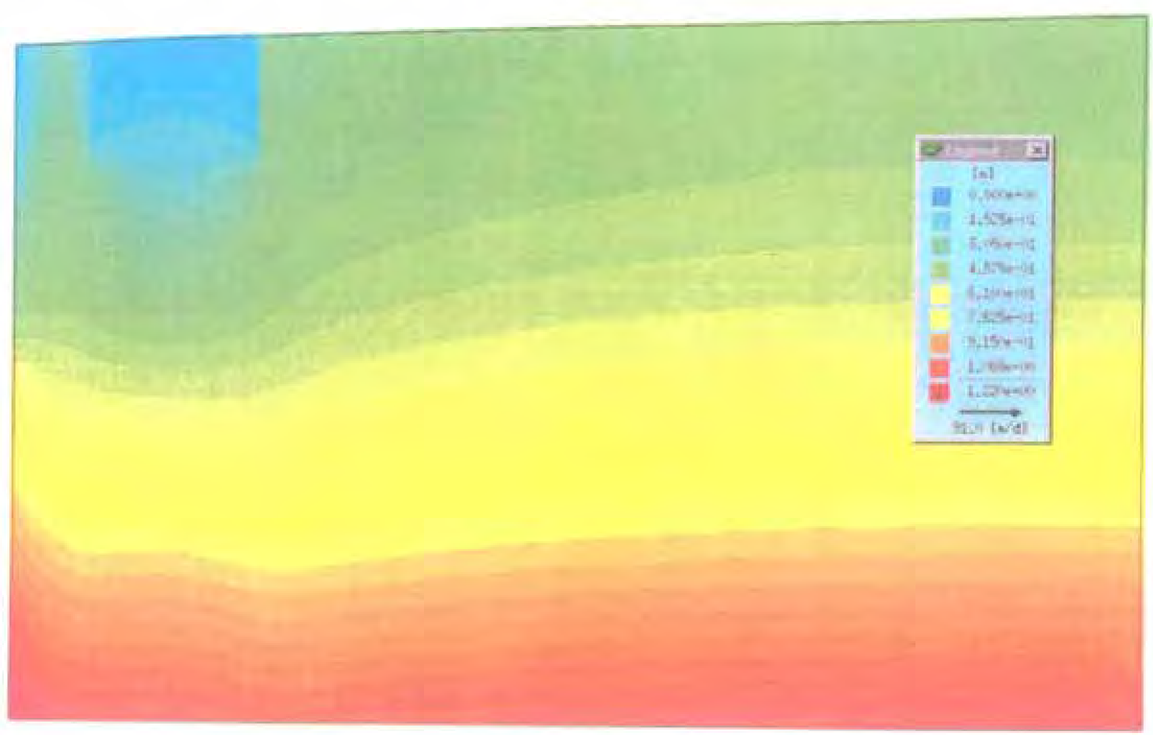


Figure 23: Distribution of heads in m (Albany Marina and curtainwall, fringes in segment 1, vertical exaggeration 20x)

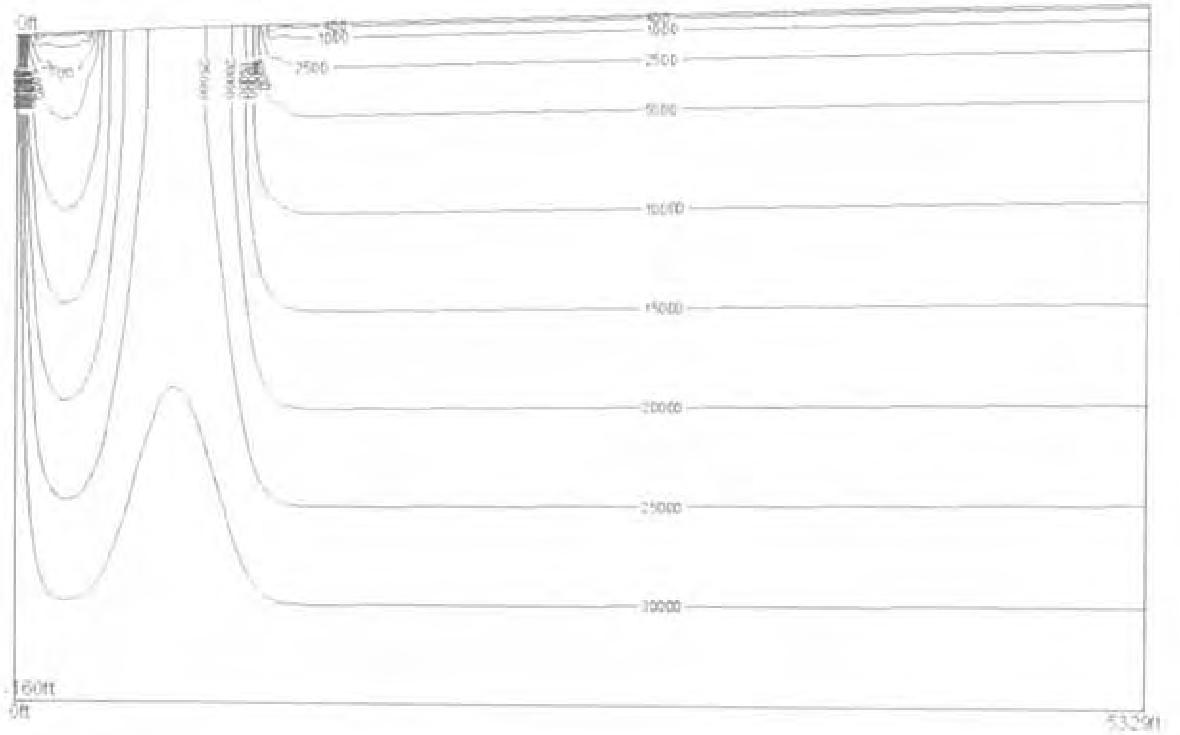


Figure 24: Distribution of concentrations in mg/l (Albany Marina and curtainwall, lines in segment 1, vertical exaggeration 20x)

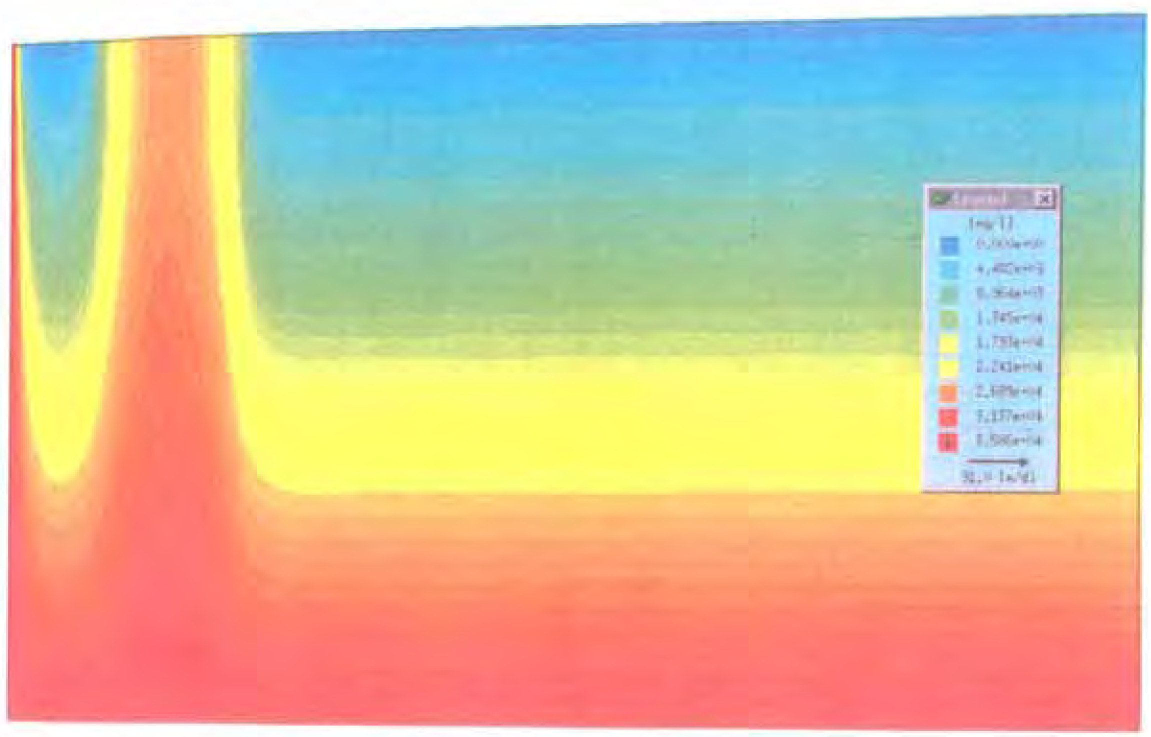


Figure 25: Distribution of concentrations in mg/l (Albany Marina and curtainwall, fringes in segment 1, vertical exaggeration 20x

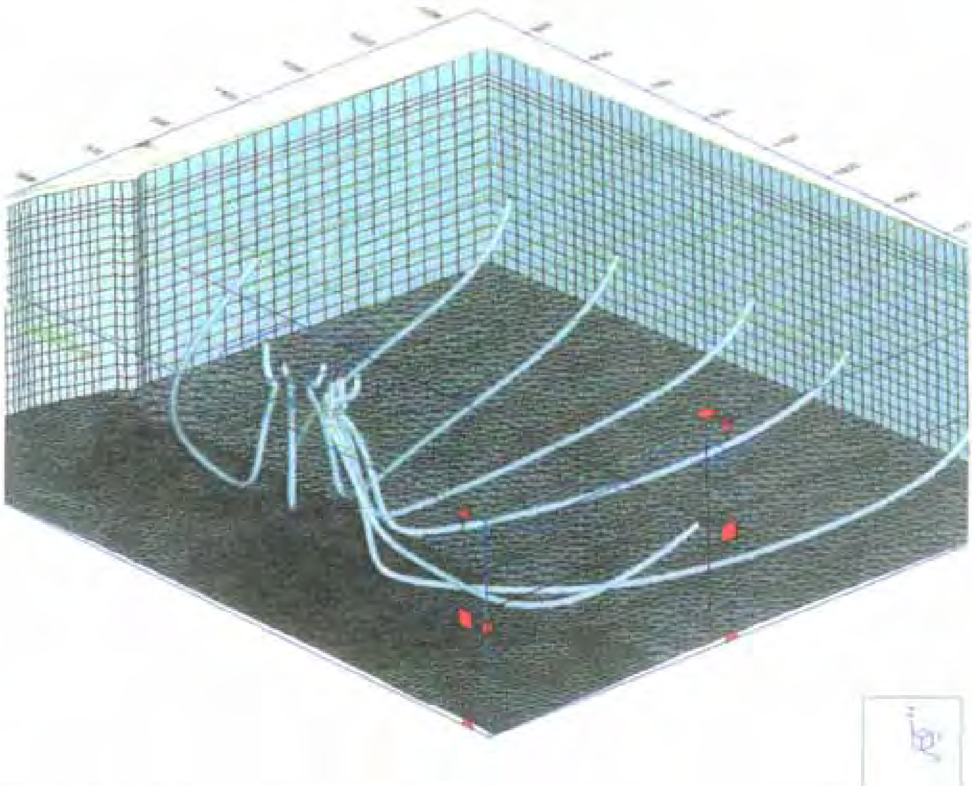


Figure 26: Pathlines (Albany Marina and curtainwall, vertical exaggeration 10.5x)

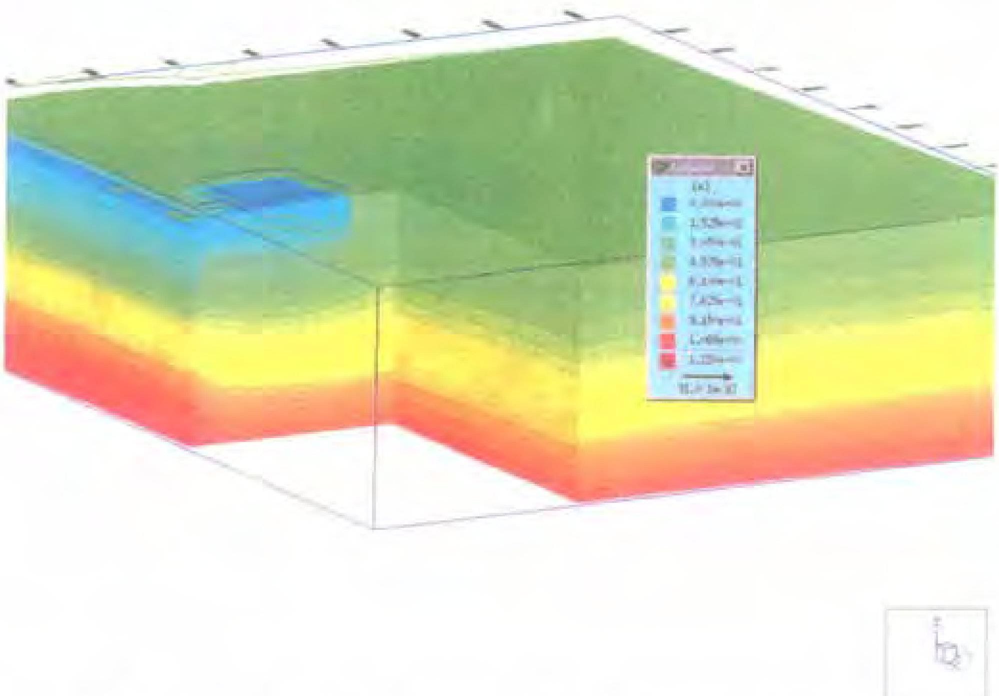


Figure 27: Distribution of heads in m (Albany Marina and curtainwall, vertical exaggeration 10.5x)

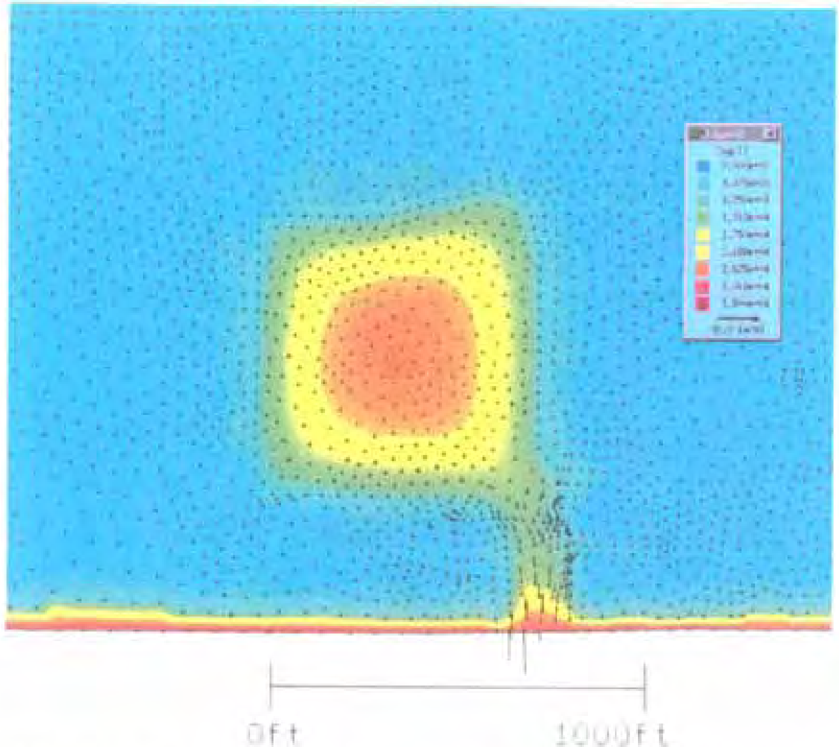


Figure 28: Distribution of concentrations in mg/l (Albany Marina and curtainwall, slice 2)

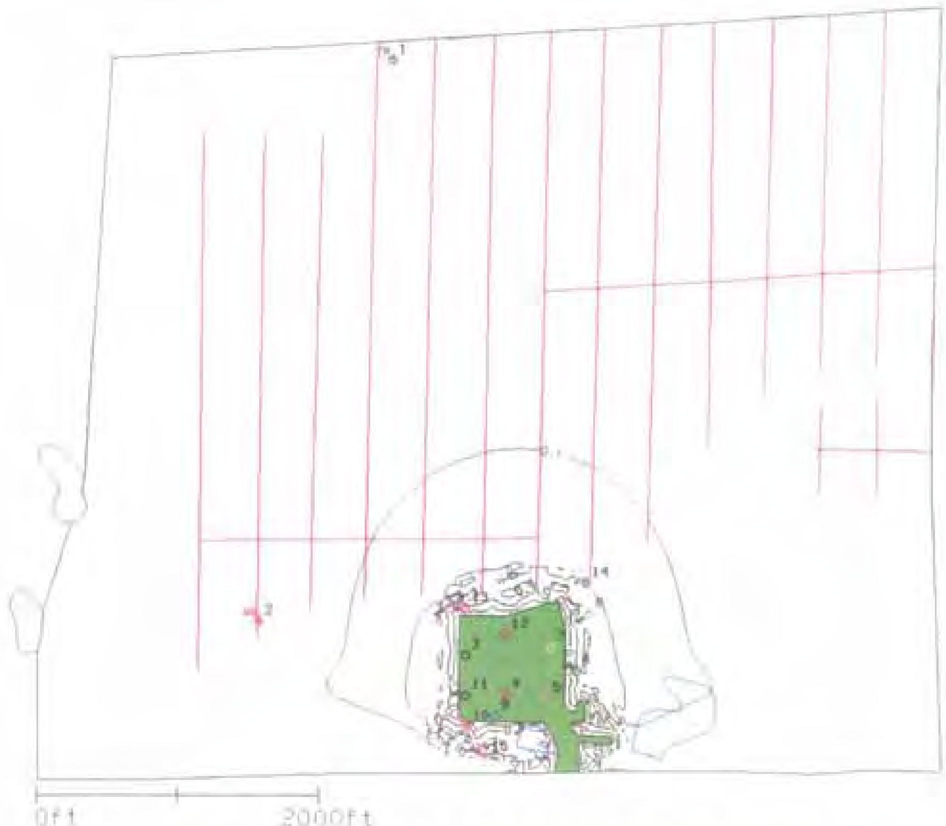


Figure 29: Influence radius for 0.1 and 0.5 mg/l (Albany Marina only)

Figure 30: Influence radius for 0.1 and 0.5 mg/l (Albany Marina and curtainwall)

APPENDIX IV

DESIGN CODE FOR ALBANY DEVELOPMENT
DPZ, 2005

DESIGN CODE (DPZ, 2005)

The Design Code is conceived and administered to guide the building of the community of Albany. This Code assures that all new buildings are harmonious with each other and with the language of the traditional architecture of the area. This Code further assures that the community supports a structure having the following characteristics:

- The neighborhood is limited in size by a pedestrianshed.
- Residences, shops, workplaces, and civic buildings are included in close proximity.
- A variety of thoroughfares serve the needs of the pedestrian and the automobile equitably.
- Building frontages in disciplined alignment define the public space.
- Public spaces in the form of squares, greens, parks, and playgrounds provide places for social activity and recreation.
- Civic buildings reinforce the identity of the community, providing places for assembly.

The Design Code is legally binding by contract with the Albany Community Association as a condition of the purchase of land within the community. It is administered by the Albany Town Architect. The Town Architect reviews all improvements to Albany for adherence to the Design Code. In matters of urban structure and aesthetics, the provisions of this Code shall take precedence over local zoning codes, subdivision regulations, and ordinances. In matters of health and safety, the local zoning codes and ordinances shall take precedence. Waivers to provisions of this Code are considered unique and are not to set a precedent for future waivers. A waiver may be granted administratively by the Town Architect on the basis of hardship, merit, or excellence. Variances may be granted by the Town Architect on the basis of architectural merit, site conditions, and/or other extenuating or unusual circumstances. The Design Code is a series of prescriptions, some of which are mandatory and others which are only recommended. The mandatory prescriptions are indicated by the verb "shall," and the recommended ones by the verb "should." Options that are allowed are indicated by the verb "may." To ensure authentic variety, no architecture firm shall prepare the schematic design of more than one contiguous block face. It is the design intention, not the "letter", of this code to which the designs must conform.

THE DESIGN CODE consists of four documents to be used in conjunction:

G R E E N S T A N D A R D S

The **Green Standards** incorporate many of the principles and practices of sustainable architectural design found in A Green Vitruvius.

R E G U L A T I N G P L A N

The **Regulating Plan** is a map showing the various transect-based zoning categories with precision. The Regulating Plan also shows the form and location of public spaces and the types and trajectories of thoroughfares.

T H O R O U G H F A R E S T A N D A R D S

The **Thoroughfare Standards** are a matrix of drawings, specifications, and dimensions that assembles vehicular and pedestrian ways into sets, specialized in both capacity and character. These specify travel lanes, parking lanes, curbs, planters, street trees, streetlights, and sidewalks.

U R B A N & A R C H I T E C T U R A L S T A N D A R D S

The **Urban & Architectural Standards** are a matrix of text and diagrams that regulate those aspects of private buildings which affect the public realm, and that specifies the materials and configurations permitted for walls, roofs, openings, and facades intended to produce visual compatibility among disparate building types. The standards relate to the vernacular building traditions of the region thus inheriting a suitable response to climate. The quality of the whole neighborhood is directly related to the quality of the individual buildings. Because urban quality is enhanced by architectural harmony but is not dependent on it, the provisions of the architectural standards may range from liberal to strictly deterministic.

F R O N T A G E T Y P E S

The Frontage Types define the streetscape and encourage the provision of certain building types and frontage elements that influence social behavior.

L A N D S C A P E S T A N D A R D S

A list of plant species with instructions regarding their location and planting pattern. The lists are separated into those pertaining to public areas and to private lots. The planting lists are coordinated toward achieving a coherent landscaping of the urban fabric. The selection and disposition of the planting is intended to support the urban-to-rural transect and to create an ecosystem compatible with the climate and hydrology of the site.

I N T R O D U C T I O N

In addition to its own requirements, the Green Standards for the community of Albany include many of the principles and practices of sustainable architectural design found in A Green Vitruvius. Following is a menu of techniques available to be used for the sustainable design of the community of Albany.

S U S T A I N A B L E S I T E S

Erosion & sedimentation control shall: prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse; prevent sedimentation of storm sewer or receiving streams; and prevent polluting the air with dust and particulate matter.

Thoroughfares, buildings, and parking areas shall not be built on prime farmland, land lower than 5 feet above the elevation of the 100-year flood, threatened or endangered species habitat, land within 100 feet of wetlands and isolated wetlands, or public parkland.

Transit shall be supported by designing the project to be “transit ready” by including locations for future transit stops at neighborhood centers.

Secure bicycle storage and convenient changing/shower facilities (within 200 yards of the building) for 5% or more of the occupants of commercial and civic buildings should be provided. Secure bicycle storage for 15% or more of building occupants of multi-family residential buildings should be provided.
Alternative fuel vehicles, and preferred parking for them, should be provided for 3% of the occupants of commercial and civic buildings. Alternative-fuel refueling stations should be provided for 3% of the total vehicle parking capacity of the site.
Parking capacity shall not exceed minimum local zoning requirements. Preferred parking shall be provided for carpools and vanpools capable or serving 5% of the building occupants. No new parking should be provided for rehabilitation projects.
Site disturbance on greenfield sites (including earthwork and clearing of vegetation) should be limited to 40 feet beyond the building perimeter; 5 feet beyond primary roadway curbs, walkways, and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, storm water detention facilities, and playing fields).
Storm water treatment systems should be designed to remove 80% of the average annual post-development total suspended solids (TSS) and 40% of the average annual post-development total phosphorous (TP) based on the average annual loadings from all storms less than or equal to the 2-year/24-hour storm.
The heat island effect should be reduced by providing shade (within 5 years) and/or using light-colored/high-albedo materials (reflectance of at least 0.3) and/or open grid pavement of at least 30% of the site's non-roof impervious surfaces, including parking lots, walkways, plazas, etc.; or, placing a minimum of 50% of parking spaces underground or covered by structured parking; or, using an open-grid pavement system (less than 50% impervious) for a minimum of 50% of the parking lot area.
Roofing should be highly reflective and high emissivity roofing for a minimum of 75% of the roof surface.
Light Pollution should be reduced by designing exterior lighting such that all exterior luminaries with more than 1000 initial lamp lumens meet the Full Cutoff IESNA Classification.

W A T E R E F F I C I E N C Y
Irrigation for landscaping should incorporate high-efficiency technology or use captured rain or recycled site water to reduce potable water consumption for irrigation by 50% over conventional means. Irrigation for landscaping should not require irrigation at all or, if required, use no potable water and instead use only captured rain or recycled site water (except for initial watering to establish plants).
Wastewater should be treated on site to tertiary standards. If this is not possible, the use of municipally provided potable water required for building sewage conveyance should be reduced by a minimum of 50% over conventional means.
Water use should be reduced 20% in aggregate over conventional water use (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Water use should be reduced 30% in aggregate over conventional water use (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements.

E N E R G Y & A T M O S P H E R E

Fundamental building systems commissioning shall include:

1. Engage a commissioning team that does not include individuals directly responsible for project design or construction management.
2. Review the design intent and the basis of design documentation.
3. Incorporate commissioning requirements into the construction documents.
4. Develop and utilize a commissioning plan.
5. Verify installation, functional performance, training and operation, and maintenance documentation.
6. Complete a commissioning report.

Additional commissioning should include**:**

1. A commissioning authority independent of the design team to conduct a review of the design prior to the construction documents phase.
2. An independent commissioning authority to conduct a review of the construction documents near completion of the construction document development and prior to issuing the contract documents for construction.
3. An independent commissioning authority to review the contractor submittals relative to systems being commissioned.
4. Providing the owner with a single manual that contains the information required for re-commissioning building systems.
5. A contract to review building operation with O&M staff, including a plan for resolution of outstanding commissioning related issues within one year after construction completion date.

Energy performance of each building should, at a minimum, comply with the more stringent of ASHRAE/IESNA Standard 90.1-1999 or the local energy code.
CFC-based refrigerants are prohibited in new HVAC&R systems and should be phased out of existing systems.
Energy performance should be optimized by reducing design energy cost.
On-site renewable energy systems should supply at least 5% of the building's total energy use (as expressed as a fraction of annual energy cost) and should supply at least 20%.
Ozone impact should be reduced by **i**nstalling base building level HVAC and refrigeration equipment and fire suppression systems that do not contain HCFCs or Halons.
Measurement and verification equipment should be installed for the following end-uses: • Lighting systems and controls • Constant and variable motor loads • Variable frequency drive (VFD) operation • Chiller efficiency at variable loads (kW/ton) • Cooling load • Air and water economizer and heat recovery cycles • Air distribution static pressures and ventilation air volumes • Boiler efficiencies • Building-related process energy systems and equipment • Indoor water risers and outdoor irrigation systems
Electricity for at least 50% of the demand should be from renewable sources.

MATERIALS & RESOURCES

Recyclables for buildings other than single-family homes should be collected and stored in an easily accessible area that serves the entire building and is dedicated to the separation, collection, and storage of materials for recycling.

Building Reuse. At least 75% of existing building structure and shell (exterior skin and framing, excluding window assemblies and non-structural roofing material) should be maintained. 100% of existing building structure and shell (exterior skin and framing, excluding window assemblies and non-structural roofing material); and at least 50% of non-shell areas (interior walls, doors, floor coverings and ceiling systems) should be maintained.

Construction Waste Management. At least 50% of construction, demolition, and land clearing waste should be recycled and/or salvaged. At least 75% of construction, demolition, and land clearing waste should be recycled and/or salvaged.

Resource Reuse. Salvaged, refurbished, or reused materials, products, and furnishing should be used for at least 5% of building materials and should be used for at least 10%.

Recycled Content. Materials with recycled content should be used such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 5% of the total value of the materials in the project. The total value should be at least 10%.

Regional Materials. A minimum of 20% of building materials and products that are manufactured regionally (within a radius of 500 miles) should be used. Of these materials and products, a minimum of 50% should be extracted, harvested, or recovered (as well as manufactured) within 500 miles of the project site.

Rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) should be used for 5% of the total value of all building materials and products used in the project.

Wood-based materials and products certified in accordance with the Forest Stewardship Council's Principles and Criteria should be used for a minimum of 50% of wood building components including, but not limited to, structural framing and general dimensional framing, flooring, finishes, furnishings, and non-rented temporary construction applications such as bracing, concrete form work, and pedestrian barriers.

INDOOR ENVIRONMENT

Ventilation for indoor air quality should meet the minimum requirements of voluntary consensus standard ASHRAE 62- 1999 using the Ventilation Rate Procedure.

Environmental tobacco smoke (ETS) should be controlled such that there is zero exposure of non-smokers to ETS.

A permanent carbon dioxide (CO_2) monitoring system should be installed that provides feedback on space ventilation performance in a form that affords operational adjustments.

Ventilation systems should result in an air change effectiveness (Eac) greater than or equal to 0.9 as determined by ASHRAE 129-1997. Naturally ventilated spaces should have a distribution and laminar flow pattern that involves not less than 90% of the room or zone area in the direction of air flow for at least 95% of hours of occupancy.

An indoor air quality management plan should be implemented as follows: For construction and pre-occupancy phases of a building: • During construction, meet or exceed the recommended Design Approaches of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 1995, Chapter 3. • Protect stored on-site or installed absorptive materials from moisture damage. • If air handlers must be used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grill, as determined by ASHRAE 52.2-1999. • Replace all filtration media immediately prior to occupancy. Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13, as determined by ASHRAE 52.2-1999 for media installed at the end of construction. After construction ends and prior to occupancy: • Conduct a minimum two-week building flush-out with new Minimum Efficiency Reporting Value (MERV) 13 filtration media at 100% outside air. After the flush-out, replace the filtration media with new MERV 13 filtration media, except the filters solely processing outside air. Or, conduct a baseline indoor air quality testing procedure consistent with the US EPA's current *Protocol for Environmental Requirements, Baseline IAQ and Materials, for the Research Triangle Park Campus, Section 01445.*

Adhesives & sealants should have a VOC content less than the current VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168; and, all sealants used as fillers must meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.

Paints and coatings should have VOC emissions that do not exceed the VOC and chemical component limits of Green Seal's Standard GS-11 requirements.

Carpet systems should meet or exceed the requirements of the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program.

Composite wood and agrifiber products should contain no added urea-formaldehyde resins.

Permanent entryway systems (grills, grates, etc.) should be used to capture dirt, particulates, etc., from entering the building at all high volume entryways.

Where chemical use occurs (including housekeeping areas and copying/printing rooms) areas should be segregated with deck-to-deck partitions with separate outside exhaust at a rate of at least 0.50 cubic feet per minute per square foot, no air re-circulation, and maintaining a negative pressure of a least 7 PA (0.03 inches of water gauge).

Drains plumbed for appropriate disposal of liquid waste should be provided in spaces where water and chemical concentrate mixing occurs.

One operable window and one lighting control zone per 200 square feet should be provided for all regularly occupied areas within 15 feet of the perimeter wall.

Airflow, temperature, and lighting controls should be provided for at least 50% of the occupants in non-perimeter, regularly occupied areas.

Thermal comfort standards should comply with ASHRAE 55- 1992, including humidity control within established ranges per climate zone. For naturally ventilated buildings, the adaptive comfort temperature boundaries should meet the 90% acceptability limits as defined in the California High Performance Schools (CHPS) Best Practices Manual, Appendix C – A Field Based Thermal Comfort Standard for Naturally Ventilated Buildings, Figure 2.

A permanent temperature and humidity monitoring system should be permanently installed and configured to provide operators control over thermal comfort performance and the effectiveness of humidification and /or dehumidification systems in the building.

A daylight factor of at least 2% (excluding all direct sunlight penetration) should be achieved in 75% of all space occupied for critical visual tasks in commercial buildings. Spaces excluded from this requirement included copy rooms, storage areas, mechanical plant rooms, laundry, and other low occupancy support areas. Other exceptions for spaces where tasks would be hindered by the use of daylight will be considered on their merits. **Direct line of sight to vision glazing** for all occupants of commercial buildings should be achieved in 90% of all regularly occupied spaces. Examples of exceptions include copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas. Other exceptions will be considered on their merits. The transect is a geographical cross-section of a region used to reveal a sequence of environments. For human environments, this cross-section can be used to identify a set of habitats that vary by their level and intensity of urban character, a continuum that ranges from rural to urban. In transect planning, this range of environments is the basis for organizing the components of the built world: building, lot, land use, street, and all of the other physical elements of the human habitat. One of the key concepts of transect planning is the idea of creating what are called immersive environments. Successful immersive environments are based, in part, on the selection and arrangement of all the components that together comprise a particular type of environment. Each environment, or transect zone, is comprised of elements that keep it true to its locational character. Through a complete understanding of the transect, planners are able to specify different urban intensities that look and feel appropriate to their locations. For instance, a farmhouse would not contribute to the immersive quality of an urban core, whereas a highrise apartment building would. Wide streets and open swales find a place on the transect in more rural areas while narrow streets and curbs are appropriate for urban areas. Based on local vernacular traditions, most elements of the human habitat can be similarly appropriated in such a way that they contribute to, rather than detract from, the immersive character of a given environment. T1 The Natural Zone consists of lands approximating or reverting to a wilderness condition, including lands unsuitable for settlement due to topography, hydrology or vegetation. T2 The Rural Zone consists of lands in open or cultivated state or sparsely settled. These may include woodland, agricultural lands, grasslands and irrigable deserts. The Sub-Urban Zone, though similar to conventional suburban single-family house areas, differs by its superior connectivity and by allowing home occupations. It is typically adjacent to other urban T-Zones. This zone is naturalistic in its planting. Blocks may be large and the roads irregular to accommodate site conditions. T3 The General Urban Zone has a denser and primarily residential urban fabric. Mixed-use is usually confined to certain corner locations. This Zone has a wide range of building types: single, sideyard, and rowhouses. Setbacks and street tree spacing are variable. Streets typically define medium-sized blocks. T4 The Urban Center Zone is the equivalent of a Main Street area. This Zone includes mixeduse building types that accommodate retail, offices, and dwellings, including rowhouses and apartments. This Zone is a tight network of streets and blocks, with wide sidewalks, steady street tree planting and buildings set close to the frontages. T5 The Urban Core Zone is the equivalent of a downtown. It contains the densest urbanism— the tallest buildings and the greatest variety of uses, particularly unique ones such as a financial district and important civic buildings. The Urban Core is the least naturalistic of all the Zones; street trees are formally arranged or nonexistent.

THE REGULATING PLAN

The Regulating Plan assigns the Transect Zones within the community of Albany. The Transect Zones impose the discipline of the distribution of densities and building types throughout the plan. They also create a high degree of flexibility as several building types can be applied in every Transect Zone. The Regulating Plan also shows the form and location of public open spaces.

The Urban and Architectural Standards regulate those aspects of private buildings such as building use, height, and frontage elements that affect the public realm; and specify the materials and configurations permitted for walls, roofs, openings, and facades intended to produce visual compatibility among disparate building types. The standards relate to the vernacular building traditions of the region, thereby inheriting a suitable response to climate.

ARTICULATION

The size of a building is independent of its scale. The scale can be modified through articulation of the massing. One can articulate massing in plan (in & out), in elevation (up & down), or both. The problem of size results from building on a large lot within an urban context of small lots. Overly long buildings should be broken down to a scale comparable to that of the buildings on the rest of block face. This can be accomplished by articulating the building in plan or elevation, and several inches may be enough. Scale is most effectively modified when the various integral elements of the facade (windows, balconies, loggias and parapets) support the articulation. The articulation of massing has a valid purpose beyond simply its use to manipulate scale. Articulation is a compositional technique justified by its meaningful relationship to an urban condition. An articulation may acknowledge the corner of a block; another may emphasize an entrance; yet another may receive the visual axis of an adjacent street. The maximum building height shall be measured in number of stories, each story not to exceed 12 feet clear, except retail stories which shall be between 12 and 18 feet clear to allow the insertion of a partial mezzanine level. Non-retail spaces shall have a minimum ceiling height of 9 feet. A building's first-floor ceiling height should be a minimum of 2 feet taller than that of its upper floors. Height shall be measured from sidewalk grade anywhere along the principal frontage line. The articulation of courtyards shall maintain a minimum width: height ratio of 1:3 in at least one dimension, in order to avoid lightwell conditions.

FRONTAGES

Frontage is the privately held layer between the facade of a building and the lot line. The combination of the private frontage, the public streetscape, and the types of thoroughfares defines the character of the majority of the public realm. The frontage of a building is a primary contribution to pedestrian activity. Elevations to interior side and rear property lines (including those facing alleys) are not frontages. Greater care shall be devoted to frontages in the architect's design and in the allocation of expense and workmanship by the developer. For the purposes of this code, commercial includes retail, office, and restaurant uses. Commercial on the first floor shall hold entirely to the frontage line except for a setback surrounding the front door. The door shall be recessed a minimum of 3 feet from the frontage line, but the area of this recess shall not exceed 50 square feet. It shall be paved to match the sidewalk. The frontages of new buildings shall be harmonious with the block face on both sides of the street. Applicants are expected to provide drawn and/or photo documentation of the block faces with the proposed frontage shown within its urban context. Buildings located on the Vista Termination Arrows indicated in the Regulating Plan shall respond with a building element of appropriate size and impact to terminate the vista meaningfully. These shall be aligned properly to be framed symmetrically in the vista. When a vista approaches a property at an angle, it must be noted that a vista termination's proper location will vary depending on its depth within the lot. Proper vista terminations include two-story porches, bay windows, prominent gables, grouped window compositions, towers, cupolas, and widow's walks. Permitted base frontage types are: (a) Buildings that place 75% - 100% of their frontage facade along the frontage line. The frontage can be a gallery or a shopfront with awnings. This type may accommodate commercial uses and is appropriate for the T-6 zone. (b) Buildings that place a minimum of 60% - 75% of their frontage facade along the frontage line. This type is appropriate for the T-5 zone. (c) Buildings that place a maximum of 25% of their frontage facade along the frontage line. This type is appropriate for the T-4 zones. (d) Buildings that place only unconditioned pavillions or outbuildings along the frontage line. This type is appropriate for the T3-T4 zones. Galleries shall be permitted to overlap the enfronting sidewalk to within 1.5 feet of the curb. The interior passage of galleries shall be a minimum of 14 feet wide and 14 feet high. Each opening of the gallery on the facade shall be vertical, measured to the top of its arch or lintel. Galleries shall span over the sidewalk. The ceiling of the gallery shall be equipped with visible beams. The base is composed of the first to second stories of the frontage of a building. It is this portion that has the greatest effect on pedestrian activity. The design of the base, as well as the quality and durability of its materials, should be emphasized. In addition to a base, an urban building includes a middle section and a cap. The middle of the building shall be differentiated from the base by a transition line at the top of the first or second floor. The transition line's specific location is determined primarily by the overall height of the building and that of the adjacent buildings. If adjacent buildings are lower than the proposed building, and judged likely to be permanent, then an effort should be made to have the transition line relate to them. Base transition line locations depend on the overall height of the building. Usually this transition line occurs above the first floor. This line should be positioned between one third and one fifth of the building height. The cornice of the building should be between one fifteenth and one nineteenth of the building height. An expression line may consist of a continuous, shallow balcony; a short setback. The transition should be supported by a change of window rhythm or size and a change in material or color. The roof of a building should be pitched, flat, or both. The rooftop shall be designed thoughtfully as it will be seen from taller buildings, existing or future. If the roof is pitched, it shall be clad with one of the high-grade materials. If the roof is flat, designing it as a terrace attached to a partial penthouse is the best way to achieve visual adequacy. The materials, landscaping, and furnishing of a terrace provide an adequate visual finish. Transformers, lift stations, dumpsters, condensers, junction boxes, meters, signal boxes, and other utilities shall be located away from frontages (possibly along the back lakes) and/or masked as necessary so as not to be visible from streets, squares, and pedestrian paths. The location and masking of rooftop machinery shall be as consciously designed as any other aspect of the building. The architectural design of parapets shall be consistent with the rest of the building to minimize the negative aesthetic impact upon the view from adjacent buildings and from street level. No architectural firm shall complete the schematic design of more than 300 feet of frontage on a given street block. However, a single firm may prepare construction drawings consolidating the schematic designs of a number of independent firms.

INTEGRAL ELEMENTS Certain trim elements (especially at the eaves or associated with balconies and trellises) may be made of heavy, finished timber. Wood may be used for the fabrication of small architectural elements such as posts, brackets, and railings. The design of the wood components shall be drawn in detail. The openings on a frontage must remain within a voidto- solid ratio of between 25% and 45%, with each facade measured independently. The void-to-solid calculations shall not include the shopfront. Disharmony arises when the range of void-to-solid variation is extreme, approaching that of the all-glass office building or the multi-balconied condominium. The solid-to-void ratio of the frontage includes fenestration (windows), porches, arcades, loggias, and balconies. Commercial fenestration at the base (as in shopfronts) has the opposite constraint. It should be not less than 70% void. A shopfront shall have a continuous kick plate between 18 and 42 inches. Porches, galleries, and loggias may have localized high void-to-solid ratios. However, a continuous series of these elements can undermine the solidity of a facade and should be avoided. Balconies are elements of the vernacular, but they must be used sparingly. This pertains to both indented balconies (loggias) and to cantilevered ones. The effect of a facade saturated with balconies is no less disruptive than the all-glass building. Balconies are best used as a single, continuous element at the location of the upper or lower expression lines. They may also be used singly as a periodic element of the facade composition. Multiple balconies, if required, shall face frontages. Balconies can be as simple as railings in windows flush with the opening or projecting 3 to 4 inches. These balconies add variety to a facade without overpowering it with too many ins and outs. Cantilevered balconies shall be no deeper than 3 feet and shall be visibly supported by brackets. In the case of balconies that are nearly flush with the facade and associated with inwardly swinging doors (French balconies), there may be as many balconies as there are doors. Being co-planar with the facade, such balconies do not dematerialize the facade. Balconies may have masonry or metal railings. They shall be detailed so that the 42-inch required railing height is reproportioned by a separation of the grille and the handrail , or by some such method. Windows shall be subdivided into square or vertically proportioned lights by muntins. The lights throughout the building shall be uniform in proportion. Muntins on windows at ground level shall be true divided lites. Under no circumstances shall the windows be installed flush with the outer surface of the facade. Installation should be flush with the interior wall, as this increases the depth of the shadow cast. It is possible to turn the masonry unit inward at each opening to create a visually thick wall. This shall be the practice in the case of French balconies, loggias, and larger openings. Windowsills shall be provided while lintels may be provided. The windowsill may slightly overlap the width of the window opening but shall not project more than 2 inches.

Loggias and arcades shall have columns and piers of a width and depth proportional to the height of the element. A rule of thumb is a width-to-height ratio between 1:6 and 1:8, but in no case less than 16 inches wide. The proportion and detail of columns or piers in the classical language shall be exactly as described in The American Vignola (Dover Press). It requires the correct use of the classical syntax, including capital, base, entasis, and moldings, corresponding with the selected order. The top shaft of chimneys shall be substantial, no less than 32 x 32 inches in plan, and each shall be finished with a design at its top. Bay windows shall be fabricated of material other than the wall material and shall be three-sided.

STREETSCAPES
Vehicular carriage ways shall be constructed of asphalt. Curbs shall be vertical without horizontal lips (no gutter pans) and no higher than 4 inches. The main portion of sidewalks shall be constructed in concrete with mica added in retail areas to sparkle at night. In retail areas, the outer 4 to 5 feet of sidewalks shall be constructed of bricks (or similar pavers) between tree pits, covering a continuous tree trench. Building entrances and the columns of arcades and galleries shall, when possible, be coordinated with street trees and on-street parking spaces. Built-in benches should be placed at building walls along sidewalks, particularly those near building entrances in the same material as the foundation wall.

PARKING
Any parking structures or parking lots along frontages shall be masked by a habitable liner space or a wall at ground level. WALLS Building walls shall be stone, stucco, cast stone, smoothcut wood shingle and wood clapboard, dropsiding, or lightweight or cementitious (Hardiplank or equal) siding with a maximum of 8 inches to the weather or board-and-batten. Building walls shall show no more than two materials in addition to the basement or undercroft. Materials shall change only along a horizontal line. The heavier material shall always be below the lighter material. Materials and colors shall be subject to the approval of the Town Architect. Stone shall be set in an uncoursed ledgerstone pattern. Stucco shall be cement and may be integral color or painted. Finish shall be smooth-trowelled or sand-finished and shall not show the mark of the trowel. Full size samples of alternate textures shall be subject to approval by the Town Architect. Shingles shall be 5 inches maximum to the weather, machine cut with the bottom edges aligned. Butt joints between wood siding pieces may be caulked or covered but must be painted. Front and side facades of any one building shall be made of the same materials, similarly detailed, etc. Arches and piers shall be stone, stucco, or cast stone and no less than 16 x 16 inches. Posts shall be wood or synthetic wood with dimensions of no less than 4 inches. Columns shall be wood or synthetic wood, of the Tuscan or Doric orders and proportioned according to The American Vignola. Intercolumniation on the ground floor shall be vertically proportioned. Foundation walls, piers, and pilings shall be parged block, smooth-finished poured concrete, stone, or cast stone. Foundation walls of poured concrete shall be exposed no more than 18 inches when facing frontages. Expansion joints on facades shall be designed so they are rationalized by the logic of the composition and thus made less obvious. Expansion joint gaps shall be colored to match the surrounding wall. Trim shall be a minimum of grade “B” lumber, hardiplank or Synboard, or Azek (or equal) and shall not exceed 5/4 inches in depth or 6 inches in width at corners and around openings, except at the front entrance, which may be any

size or configuration. All exposed wood and synthetic wood products at frontages shall be painted including vinyl railings, except synthetic lattice.

ATTACHMENTS
Awnings on residential buildings are subject to the approval of the Town Architect. See "Storefronts-Awnings" for awnings on commercial buildings. Porches shall be made of wood, or concrete faced on three sides with stone or cast stone. Porch openings shall be vertical in proportion. Porches at frontages shall not be enclosed with glass or screens. They may be enclosed with louvers. Chimneys (and chimney enclosures), shall be stone, cast stone, or stucco and shall extend to the ground and have a projecting cap. Chimneys, including those venting gas fireplaces, shall be a minimum of 2:1 proportion below the shoulders in plan and capped to conceal spark arresters. Flues shall be tile or metal left to age naturally or painted black and shall be no taller than required by the building code. Chimneys projecting from a roof and not within 4 feet of an exterior wall may be simulated brick subject to the approval of the Town Architect. Wood and synthetic wood railings shall have top and bottom rails centered on the balusters. Top rails shall be eased. Bottom rails shall clear the floor and have a vertical section. Maximum spacing between balustrades shall be 4 inches clear. Metal railings shall be painted gloss black or gloss dark green. Stoops shall be stone, parged block, or smooth-finished poured concrete. If concrete, steps shall have stone walls. Stoops shall be 4 to 6 feet deep. Posts, columns, and balustrades shall be built of wood. Flower and vegetable boxes on windows and railings shall be made of wood, Synboard, or Azek (or equal). Postal numbers shall be placed on the facades facing primary frontages. Keystones shall be radial to the arch. Quoins are permitted on the classical buildings only and shall be reviewed by the Town Architect. Galleries shall extend to within 1.5 feet of the curb. The interior passage shall be a minimum of 12 feet wide and a minimum of 12 feet high. Openings to the frontage shall be vertical. Bay windows shall extend all the way to the ground or be visually supported with brackets of appropriate size. ROOFS Sloped roofs shall be slate, synthetic slate subject to the approval of the Town Architect, standing seam galvanized or painted metal, copper left to age naturally, concrete tile painted white. Sloped roofs, shall be hip or gabled hip between 9:12 and 12:12. Shed roofs (roofs that pitch in one direction) shall be permitted when the ridge is attached to an exterior wall of a building. The pitch shall be between 3:12 and 4:12. Flat roofs are permitted only when they are occupiable and accessible from an interior room and shall be edged by a railing or parapet. The railing pattern is subject to the approval of the Town Architect. Garages may have flat roofs that are not accessible if they are edged by a well-detailed parapet wall. Roof penetrations, other than chimneys, shall not face frontages and shall be black or match the color of the roof, except those made of metal which may be left natural. Eaves along the primary frontage shall overhand a maximum of inches. Gutters, downspouts, and projecting drain pipes shall be copper (not copper-coated or anodized copper) galvanized metal, or anodized or electrostatic plate aluminum. In the absence of a gutter, stone shall be placed at the drip edge. Gutters shall be ogee at taut eaves and should be halfround but may be ogee at overhanging eaves. Downspouts shall be round and, if not arranged as an integral part of the facade composition, shall be placed at the corners of the building least visible from frontages. Splash blocks shall be stone, brick, gravel, or concrete. Eaves shall be as deep and continuous as possible. Eaves may encroach into adjacent private properties a

maximum of 2 feet. Rafter tails shall not exceed 8 inches in height at their ends. Skylights shall be flat and shall not face frontages. The underside of soffits and roof overhangs on taller buildings should be elaborated and well finished, as they are generally more visible from the street than the roof material. Dormers shall be roofed with a symmetrical gable, hip, barrel, or shed roof and, if provided, shall be habitable and placed a minimum of 3 feet from side building walls. Mixed-use or commercial buildings shall have a horizontal eave to the primary frontage in the T-6 zone.

OPENINGS

Windows shall be selected from the Town Architect's Master List which includes windows of extruded aluminum, wood, vinyl, vinyl-clad wood, and Celuka Cellular PVC (e.g. Windsor Windows, Legend Series or equal) and shall have clear glass. Windows shall be double- or triple-hung or operable casements. Sliding and single-hung windows are prohibited. Openings shall be rectangular with a vertical or square proportion. Multiple windows in the same rough opening shall be separated by a 4 inch minimum post. The centerline of the window sash shall align within the centerline of the wall or closer to the interior. Flush-mounted and projecting windows are prohibited. Subject to the approval of the Town Architect, a limited number of windows may be circular, semi-circular, hexagonal, or octagonal. Windows may be quarter-circular in shape when paired in a gable end. A majority of the windows shall be rectangular with a height-to-width ratio between 1:2 and 1:3. Bay windows shall have three sides and extend to the floor inside and to the ground outside, or be visually supported by brackets, and shall be 3 feet maximum in depth. Mullions at frontages, if any, shall be true divided lites or simulated divided lites (fixed on the exterior surface to cast a shadow). Window panes throughout the building shall be uniform in size or proportion, an exception being that openings may become proportionally smaller on the upper stories. Single glass panes shall be no larger than 20 square feet. Glass shall be clear and free of color. Stained glass and art glass are subject to the approval of the Town Architect. Tinted and frosted glass and glass blocks is prohibited at frontages Doors and garage doors shall have glass, raised panels, or both. Garage doors shall be painted wood, fiberglass with a wood veneer, or embossed steel and at frontages shall be a maximum of 9 feet wide. Doors (except garage doors) shall be side-hinged (no sliders). Paired front doors are prohibited. Doors shall be painted wood, fiberglass with a wood veneer, or embossed steel. Composite wood is prohibited. Storm doors and screen doors shall be finished to match the door they serve or the trim around it, and shall be full view and free of decorative trim. An exterior light with a photocell timed to be on from dusk to dawn shall be provided at doors of buildings facing a primary or secondary frontage. Storefronts are addressed in the "Storefronts" section. Storm windows and window screens, if provided, shall cover the entire window area. Blank walls are prohibited at frontages. First-floor walls shall have at least one window per structural bay and exposed basement walls shall have at least one small window per structural bay as appropriate for an occupied foundation. Facade composition: "scattered window" facades are prohibited at frontages. Each facade shall present a unified, rational composition. The Primary Entrance to commercial and multifamily residential buildings shall face the primary frontage. Transoms and sidelights are encouraged. Square-end lintels of stone or pre-cast concrete shall extend horizontally beyond the window opening a dimension equal to the height of the lintel or half the height of the lintel. Brick soldier lintels shall be prohibited. Stone jack arches shall extend to the edge of the masonry opening. Lintels and sills should generally align to create a harmonious facade. Windowsills should receive more emphasis than lintels, since the lintel already casts a shadow line. The windowsill may extend slightly beyond the window opening and any surrounding trim but shall not project more than 2 inches. Shutters, if provided, shall be made of painted wood or synthetic wood and shall be hinged on the side, either louvered or paneled, sized and shaped to match the associated openings and shall be applied to all or none of the typical windows on any given elevation. Shutters shall be fully functional with all necessary hardware or shall be provided with adequate hardware to make them appear functional and shall be either louvered or paneled, sized and shaped to match the associated openings.

GARDENS

Fences shall be built wrought iron or of solid material subject to the approval of the Town Architect. Fences at primary frontages on neighboring lots shall be of different designs. Metal fences shall be black. Fences and garden walls at frontages shall occur along front property lines or along frontage lines if attached to the front corner of the building. The location of fences and garden walls elsewhere is subject to the approval of the Town Architect. Terminal posts in fences (corners, property line corners, openings, ends, etc..) shall be taller and wider than other interim posts. Private yard fences and walls shall follow the rules for frontage elements. Hedges may be used in addition to fences. Hedges may be used instead of fences subject to the approval of the Town Architect. Garden walls at frontages shall be stone, cast stone, or stucco to match the principal building. Gates shall be built of the fence material. Gates in hedges shall be built of wood pickets or wood boards. Gates in garden walls shall be wood, steel, or wrought iron. Retaining walls at frontages shall be stone or cast stone. Retaining walls elsewhere may be stone, cast stone, concrete, or wood. Walks shall be built flush with the ground. Walks connecting to a brick public walk shall be brick. Other walks and paths may be built of brick, stone, asphalt, or concrete. Patios shall be brick, brick pavers, stone, slate, concrete, concrete pavers, asphalt, gravel, or other materials subject to approval of the Town Architect and shall not be located at frontages. Driveways at frontages shall be brick, asphalt, or brick pavers and shall be no wider than 12 feet at the property line. The following outbuildings and landscape constructions shall be permitted and shall adhere to this code: garages, workshops, guest houses, artisan studios, garden pavilions, greenhouses, gazebos, trellises, arbors, in-ground swimming pools, outdoor tubs, sauna, handball and squash courts, pool houses and equipment enclosures, dog houses, storage sheds, etc.

STOREFRONTS

Ceiling height of non-residential stories shall be 12 feet minimum. Eighteen feet is recommended to accommodate a mezzanine level. Awnings, lights, and signs may encroach into setbacks and across R.O.W. lines but not onto private properties. Frontage setbacks shall be paved to match the sidewalk. Store doors, windows, awnings, signage, and lighting shall be designed as a unified whole. Storefront windows shall sit on a 12- to 14-inch kneewall. Windows and doors shall comprise a minimum of 70% of the storefront facade. Mullions are discouraged. Awnings shall be fabric (but not translucent fabric) or painted metal. Fabric awnings shall have a metal structure covered with canvas or synthetic canvas and be rectangular in shape with straight edges and no side panels or soffit and a minimum depth of 8 feet. Awnings should be retractable. Awnings shall not be backlit or used as signs, except for a single inscription on the flap not to exceed 6 inches in height. All awnings on a single establishment shall be identical. Awnings are not permitted on residential buildings. The cross-section of a storefront awning shall be different from that on the adjacent lot. Awnings of the quarter-round variety are prohibited. Storefronts shall have mounting bolts for signs or awnings whether or not signs or awnings are installed at the time of initial construction. Signs shall be made of wood, synthetic wood (synboard, Azek or equal), or porcelain enamelled metal. Signage: There are six types of signage permitted for commercial uses: a postal number, a sign band, a blade sign, a window sign, an awning sign, and a plaque. These are limited as follows: The postal number shall be applied near the entrance. A sign band may be 100% of the width of the building frontage, with a height not to exceed 2 feet, with a height exception for tenants larger than 10,000 square feet. The sign shall be integrally designed with the building or the associated storefronts in material and color. The sign band may not be internally lit. A blade sign may be attached perpendicular to the facade extending up to 4 feet from the frontage line and not exceeding 1.5 feet in height or extending up 2 feet from the frontage line and not exceeding 8 feet in height. One two-sided blade sign is permitted for each business with a door to the sidewalk. The blade sign shall be affixed to the facade or storefront and may project over the sidewalk so long as it does not interfere with pedestrian flow. The blade sign may not exceed 4 square feet in area and may not be translucent. A window sign stating the name of the business may be inscribed on the storefront glass, or displayed with permanently affixed cutout lettering or hand-painted gold letters. An awning sign may have an inscription on its flap, so long as it does not exceed 6 inches in height. A plaque sign shall be permanently affixed in a conspicuous location inscribed with the name of the architect and the date of completion. This plaque shall be less than 2 feet square and be made of bronze, aluminum, concrete, or stone. Other Signage: Billboards and other freestanding advertisements are prohibited, as are rooftop, flashing, moving, or internally illuminated signs. Signs painted on building walls may be permitted subject to the approval of the Town Architect. Neon is permitted inside the building and may be permitted outside the building subject to the approval of the Town Architect. Off-site and detached signs are not permitted. Commercial fronts and signs shall be a single, near-black, dark gloss or a white background color. Letters may be any color. Signs shall be integral to buildings and/or commercial fronts (between the first-floor lintels and second-floor sills) or in the building entablature (between the top-story lintel and the eave). The background of the sign shall be larger than 2 feet in height and any length and shall be externally lit only, not backlit. Letters shall be no larger than 20 inches. Commercial uses are encouraged to place tables, chairs, and temporary displays on the public sidewalk provided as a 5-foot-wide clear corridor is maintained for pedestrians. Interior Lighting: All retail establishments shall be lit in the incandescent (warmer) spectrum, whatever technology is used. Small spotlights (ideally halogen) are recommended rather than a uniform wash of light. After closing, display lights should be kept on at approx. 50% power until 10 PM. Storefront glass shall be clear, as any saturation will cause the display to become invisible behind the resulting reflection. Neither reflective (mirror) nor colored glass shall be permitted on any shopfront or windows above. The shopfront door, signage, and lighting shall be designed as a unified design. Signage shall be permitted within the following constraints: a. A building may have a postal number applied anywhere in the entrance area. b. One two-sided blade sign is permitted for each business with a door on the sidewalk level. The blade sign shall be securely affixed to the facade or storefront and may project over the sidewalk so long as it does not interfere with pedestrian flow. The blade sign may not exceed 4 square feet in area (including mounting hardware) and may not be translucent. c. Each building may have a single sign band 100% of the width of the building frontage, with a height not to exceed 3 feet. The sign shall be integrally designed with the building or the associated storefronts in material and paint color. The sign band may only be externally lit. d. A logo inscribed on the storefront glass is permitted. e. An awning may have an inscription on its flap, so long as it does not exceed 6 inches in height. f. The building shall have the name of its architect and the year of its construction inscribed on a plaque and permanently affixed in a conspicuous location. Awnings shall be colored canvas or painted metal. Awnings shall be straight, even when associated with arched openings. Such awnings shall be open at their ends (without triangular panels), and they may be fixed or retractable. Awnings shall overlap the sidewalk as much as possible, the encroachment being confined only by street lamps, street trees, and potential interference with parked vehicles at the curb. If necessary for support, metal pipe columns may be allowed on the public sidewalk, providing that they do not directly impinge on the main pedestrian flow. FIGURE 19 Facade colors shall be selected from a single quadrant of the color wheel. This technique, without specifying particular colors, allows a range that is automatically harmonious. Trim and attached elements may be white or a darker or lighter saturation of the wall color. Awnings, signage, doors, and shutters may be any color; however, dark blues, greens, and reds are traditional. Vertically-hinged shutters, when provided, shall coincide in size to the opening with which they are associated. Shutters may be made of any durable material. All hurricane or security shutters shall be designed to be visually integrated with the facade composition.

OTHER

Harmonious facade colors shall be selected from any chroma starting from white to "ox blood." Trim and attached elements shall be white. Awnings, signage, doors, shutters, and louvers may be any color; however, gloss black and dark colors are recommended. The following items are prohibited at frontages: clothes drying apparatus, air conditioner equipment, utility or gas meters, solar panels, antennas, satellite dishes, garbage containers, bird baths or statuary (except that of museum quality which may be located in front and side yards), synthetic fauna and flora, permanent grills, in-ground swimming pools, firewood (except on porches), rock gardens and vegetable gardens, recreation and play equipment (except porch swings), cloth lines, doghouses and dog runs, hot tubs and spas, ponds, etc. The following items are prohibited: window air conditioning units, above-ground pools (except those of the inflatable variety). Flagpoles less than 6 feet long may be mounted at an angle to porch columns or posts and building walls. Free-standing flagpoles are permitted on public property only. Building lighting shall be indirect incandescent. Walls of strictly residential buildings shall not be flooded or washed with light. Light fixtures shall be compatible with the style of the building to which they are attached or otherwise associated. Lighting Spectrum: All exterior lighting shall be of the incandescent or equivalent (warm) spectrum. Color-corrected sodium is recommended. Parking lots may be lit with mercury vapor lamps subject to the approval of the Town Architect. Security system signs shall be affixed to a building. Real estate sign advertising a property for sale or rent is permitted. Screening: Mechanical equipment such as air-conditioning units shall be screened from view from frontages and adjacent private yards. Zero-lot-line building walls against private property shall not provide any first-floor visual access into the adjoining lot (clerestories are permitted). Accurate Quotations: Any traditional building features, including but not limited to the classical orders (columns, architraves, friezes, cornices, pediments, etc..), Colonial detailing, Craftsman brackets, and the like shall be quoted accurately or not at all. Independent architectural eras and styles shall not be combined within a single building. The proportion and detail of columns or piers in the classical language shall be as described in the manual The American Vignola (Dover Press). It requires the correct use of the classical syntax, including capital, base, entasis, and moldings, corresponding with the selected order. Efficiency: Building appliances including windows, doors, water heaters, lighting, and appliances should be selected on the basis of energy efficiency. Air conditioning equipment should have a SEER (Seasonal Energy Efficiency Ratio) rating of at least 12. Air conditioning should not be oversized and should be supplemented by ceiling fans and cross-ventilation. Buildings should be constructed with continuous air barriers and insulation barriers. Sustainable Building Materials: Buildings should be built of "green" building materials whenever they are available at reasonable cost. Sustainable materials can correspond to the following criteria: produced locally or salvaged; recycled and/or recyclable; rapidly renewable; durable; containing a low embodied energy; manufactured in a less environmentally hazardous or toxic manner; for wood, certified in accordance with the Forest Stewardship Guidelines for environmentally responsible forest management; for refrigerants and fire suppression devices, not containing CFCs or Halon gas. Common sustainable materials include cement/wood fiber composite siding, cellulose insulation, gluelam beams, and concrete made from fly ash. Healthy Buildings: Indoor air quality should be ensured through the following techniques: specify paints, adhesives, finishes, and flooring products with low or no VOCs (Volatile Organic Compounds); specify carpeting and cabinets with low formaldehyde content; install airtight ducts; design ventilation systems that result in an air-change effectiveness (E) greater than or equal to 0.9; air-seal buildings and keep water away from foundations and walls to prevent moisture, radon, and soil gases from entering; install a permanent CO2 monitoring system. Eyesores: The following shall not be permitted where visible from frontages: panelized materials, fan louvers and vents in walls, window air-conditioning units, aboveground pools (except inflated), hot tubs, antennas, radar dishes, rear decks, permanent grills and play equipment, solar panels, and direct-vent fireplaces.

INSTRUCTIONS FOR THE PUBLIC LANDSCAPE

Soil preservation: Grades for thoroughfare and open spaces shall follow existing topography and drainage patterns. Open places shall remain silt fenced and undisturbed during construction unless specified by the grading plan. The deep soil structure of wide planting strips shall be protected from compaction with stakes and standards of access and soil movement shall be established for deep utilities and manholes. The topsoil of construction areas shall be removed, stored and amended with organic matter and coarse sand for later use.

Compaction: Deeply compacted strips shall be trenched to a depth of 3 feet and backfilled with an addition of loose topsoil, coarse sand and compost. Expanded slate and young peat shall be added further to compensate for compaction and root displacement under planting strips of Commercial Streets. Playing fields shall be underlain with a mix of coarse sand and sintered fly ash,or other suitable substitutes.

Hydrology: All planting strips shall find lower drainage outlets in preference to high placement of the root ball. Hydrological permeability shall be assured by grass or by placing cobble over coarse sand incised into the trenched strip without further compaction.

Cover: Squares shall be carefully graded, leveled, and planted with Bermuda grass sod. Playing fields and high use areas shall include appropriate varieties in the mix. Greens shall be planted or managed with appropriate low care and drought tolerant turf grasses cut high.

Nursery: Cultivars shall be searched by a plant broker. Public trees in the T3, T4, T5, and T-6 zones shall range from 10 to 16 feet high. Scarce cultivars and native trees are exempted from the height requirements. Additional trees shall be planted at an on site field nursery for replacement.

Planting procedures: All transplanted trees shall be sprayed with anti-transpirant before movement. No planting hole amendment other than the area amendment of de-compaction procedures shall be permitted. Otherwise follow the highest industry standards.

INSTRUCTIONS FOR THE PRIVATE LANDSCAPE

Planting Code: One species or cultivar of tree from the following lists shall be planted for every 24 feet of frontage or fraction. Planting other tree species is permitted, but shall not count toward the fulfillment of the code requirements or the objective of establishing a visually coherent long term spatial structure for microclimate and wildlife that is supportive of the public landscape.

Size: Acceptable tree heights on planting shall vary according to species and availability and shall be determined by the local standards.

Placement: Frontage trees shall be placed within 10 feet of the lot frontage line and its extension. Alley trees shall be placed 4 feet on either side of the back lot line. Yard trees in the T-3 zone can be placed anywhere in the property, except one species must be placed within 8 feet of the back lot line, on either side, to constitute the lane.

Substitution: One required tree may be substituted by a hedge along the side of the property lines.

Soil preservation: Existing topsoil from the building footprint shall be reserved, as much as possible. The remaining soil profile shall be protected from deep compaction during building construction by mandating and staking alley or lane access during construction. Compacted soil areas shall be decompacted and hydrological permeability assured by mechanically breaking up remnant basement soil and the addition of a mix of organically amended topsoil.

T6-T5 Royal Palm Pond Top Palm “Medjool” Date Palm **T3** Coconut Black Olive Mahogany Live Oak Sarah’s Toe

TREES UNDERSTORY T6-T5 Cocoplum Joe-Wood **T3** Bay Lavender Sea Grape Wild coffee White stopper Orange jasmine Crabwood Mastic Buttonwood Gumbo Limbo

GROUND COVER T6-T5-T4-T3 Native Ground Cover Orchids Bromeliads Flowery Vines Ferns Beach Lilly **T4** Coconut Madeira Bulnesia Albizzia spp.

S T R E E T T R E E S /F R O N T A G E Y A R D S T4 Wax Myrtle Bay Cedar Purple Trumpet Alexander Palm

PROHIBITED SPECIES Rosary pea, Woman’s tongue, Coral vine, Asparagus fern, Poor man’s Orchid, Orchid tree, Australian Pine, Beefwood, Suckering Australian pine, Day jessamine, Lather leaf, Winged yam, Air potato, Water hyacinth, Surinam cherry, Logwood, Morning Glory, Azores jasmine, Brazilian jasmine, Lantana, Shrub verbena, Angel lips, Big sage, Black sage, White sage, Prickly lantana, Jumbey, Melaleuca, Paper bark, Asian sword fern, Torpedo grass, Napier grass, Bay Rum, Almond, Castor Bean, Mexican Petunia, Asian Scaevola, Hawaiian seagrape, White inkberry, Schefflera, Queensland umbrella tree, Brazilian pepper, Bahamian holly, African tulip tree, Flame of the forest, Arrow head vine, Seaside mahoe, Cork tree, Spanish cork, Star Jasmine, Wedelia, Carpet daisy. (BEST Comission (2003), The National Invasive Species Strategy for The Bahamas. BEST, Nassau, The Bahamas, 34 pp.)

EIA Supplement 1

Potential for Nutrient Loading Related to Development
Concerns regarding the potential for nearshore nutrient additions related to the golf course and proposed development have been raised. It is widely documented that chronic eutrophication is a leading cause of decline in the health of coastal marine systems worldwide and the issue is exacerbated in the oligotrophic waters of tropics. Additionally the porous limestone terrain offers reduced attenuation of subsurface water quality.

Strategies and project components which will minimize the risk of long term nutrient enrichment are as follows;

1) **Drainage plans for the entire upland facility will maximize on-site retention of stormwater flows and allow attenuation of surface water in vegetated areas. These will include swales and ditches to minimize stormwater flows.**
2) **Conserving natural landform and native plants wherever possible.**
3) **Using salt tolerant grass species and native landscaping plants to reduce the need for additional irrigation or chemical additions (fertilizers, pesticides and herbicides).**
4) **Locating the golf course in the northernmost portion of the property, farthest from marine areas.**
5) **Incorporating a buffer zone of over 300ft between the perimeter of the development and wellfields still in use off-site and adjacent to the property.**
6) **Installing groundwater monitoring wells within the buffer zone to provide early warning mechanism and if necessary a scavenger network to intercept any potential contamination plume. Samples may be taken in concert with the attached marina water quality monitoring plan and be analyzed for total nitrogen and phosphorous.**

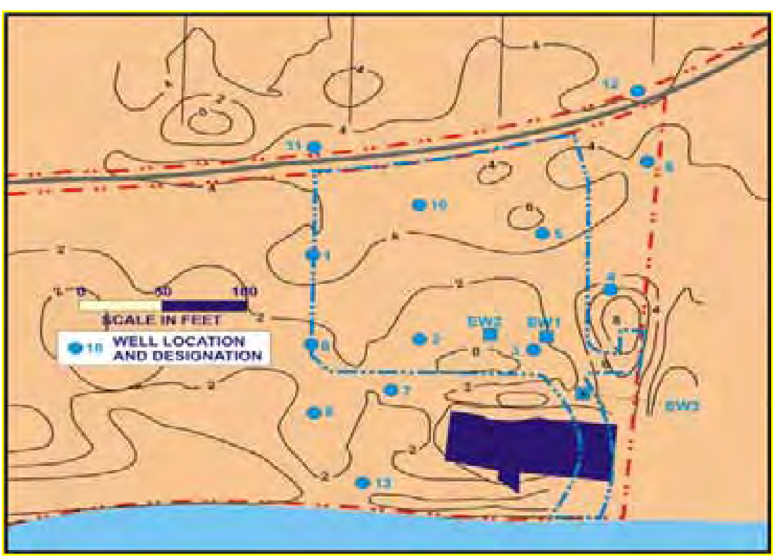
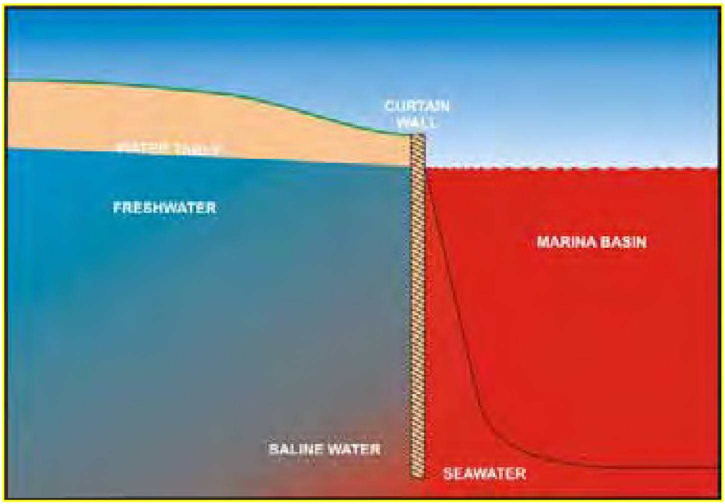


Figure 4: Monitoring well locations

7) **Construction of the curtain wall, a subsurface containment barrier a around the marina, will not only prevent saltwater encroachment into the freshwater lens, but prevent upstream groundwater from reaching the coastal zone.**

Figure 5: Curtain wall construction north of the marina basin, limiting coastal environment nutrient additions.



8) **Perched surface water bodies will be lined with an impermeable membrane to prevent the interfacing of surface water with underlying groundwater.**

EIA Supplement 5

Water Requirements
A water mass balance for the project should be provided that shows all sources and amounts of water supply (including storm water), processes and uses, and final deposition / discharge. This should encompass all project facilities, including residences, golf course, equestrian center, marina and maintenance facilities.

Please note that one of the authors of the hydrological report, Tom Missimer, used to work with a current Black & Veatch consultant, Bob Moresi (in their Tampa office). Mr. Moresi is a hydro geologist who will understand the report that has been transmitted previously and he can contact Tom directly with any specific questions.

A mass balance, or more properly a water balance or budget, was provided in the EIA document. Since there is no significant storm water runoff, it cannot be added to any water budget. The storm water rapidly infiltrates into the groundwater system and does not run off. The island is a karst system and there is no viable method of assessing storm water runoff in this case. The calculations were given in detail for water use on the golf course and for public supply.

Please be aware that any deficiency in water supply will be fulfilled by use of treated wastewater and by desalination of brackish water or seawater.

Water Supply and Use
Please clarify whether groundwater beneath the project site will continue to be used as a potable water source (by Albany or NODCO) or only for irrigation. A water mass balance diagram showing all water sources, amounts, uses, reuses/recycling and disposition should be provided for review.

The groundwater beneath the golf course may be used by designing subsurface galleries. These perforated pipes would be layered in trenches and would operate similarly to the existing trenches used to gather freshwater. They would simply be covered instead of open.

The equestrian center water quality issues will be covered by developing a modern wastewater collection system. The runoff from the center would be gathered into a wet detention area for treatment and potentially added to the golf course irrigation system.

EIA Supplement 6

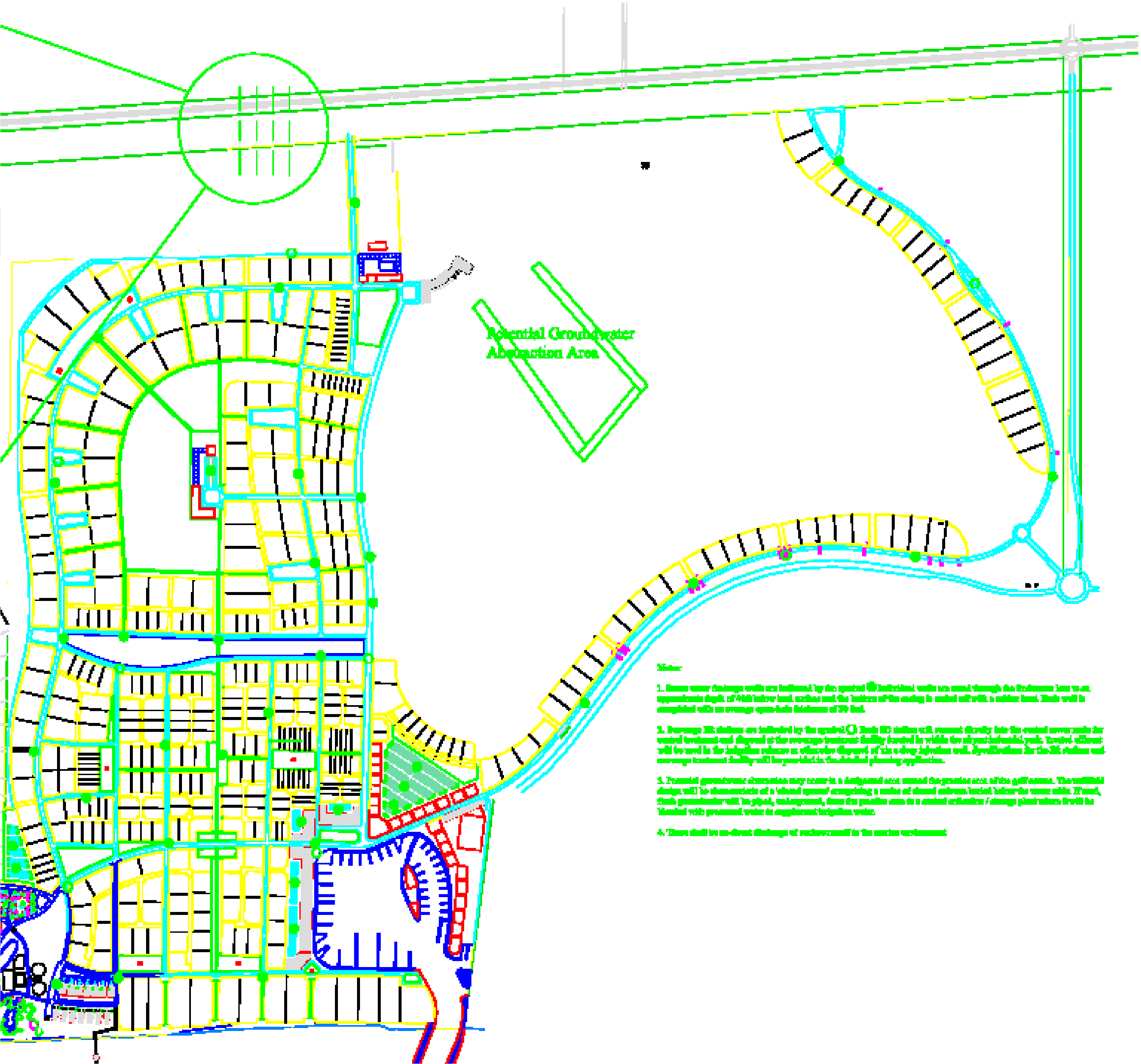
Water Mass Balance Diagram
Showing all sources, storage, processes, re-use and ultimate disposal
Pumps infrastructure for portable, process water and storm-water

Hydrogeological Infrastructure
There will be several sources of water utilized on the Albany project. Potable water will be supplied to the project by the New Providence Development Company Ltd. through its existing water franchise. Irrigation water will be supplied to the project from a number of sources; (a) a reverse osmosis plant constructed on the site, (b) storm water management ponds constructed on the golf course, and (c) treated effluent from the municipal waste water treatment plant. The logical order of utilization will be storm water, treated effluent and lastly, reverse osmosis water. Treated effluent will be supplied to the project from the Airport Industrial Park waste water be constructed on the golf course to distribute irrigation water throughout the project.

Storm water on the site will be managed to minimize environmental impacts. Although design is not complete it is anticipated that a portion of the storm water will be conveyed to the golf course ponds for irrigation use. A maximum control elevation will be maintained with deep injection wells as a means to discharge excess water. Pump infrastructure is not warranted for storm water drainage because the system can drain under gravity. There is also a series of deep injection wells scattered throughout the development that will also manage storm water runoff.

A gravity sewer system will be constructed and will convey waste water to a series of lift stations throughout the project it will then be pumped to a regional waste water treatment plant located in the Airport Industrial Park. All utility interconnects will occur on the North end of the project in the Utility Courtyard.

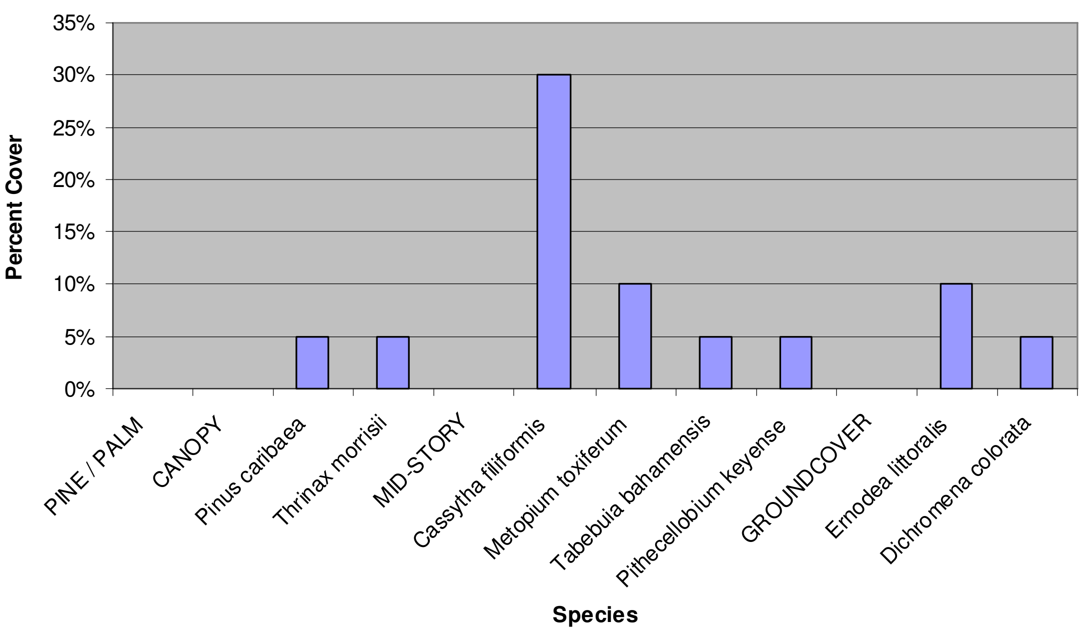
Please see the attached site map at the end of this addendum, illustrating areas for potential groundwater abstraction, storage of irrigation water, storm water disposal wells and deep disposal wells for sewerage.


Potential Groundwater
Abstraction Area

APPENDIX V

DATA SHEETS FOR TERRESTRIAL SURVEY

DATA POINT 1: Pine-palm



OCCASIONAL

Hercules club

Zanthoxylum coriaceum

Smilax

Smilax spp.

Wild fig

Ficus citrifolia

Cocoplum

Chrysobalanus icaco

Trema

Trema lamarckianum

Pigeon plum

Coccoloba diversifolia

Sawgrass

Cladium jamaicense

Pitch apple

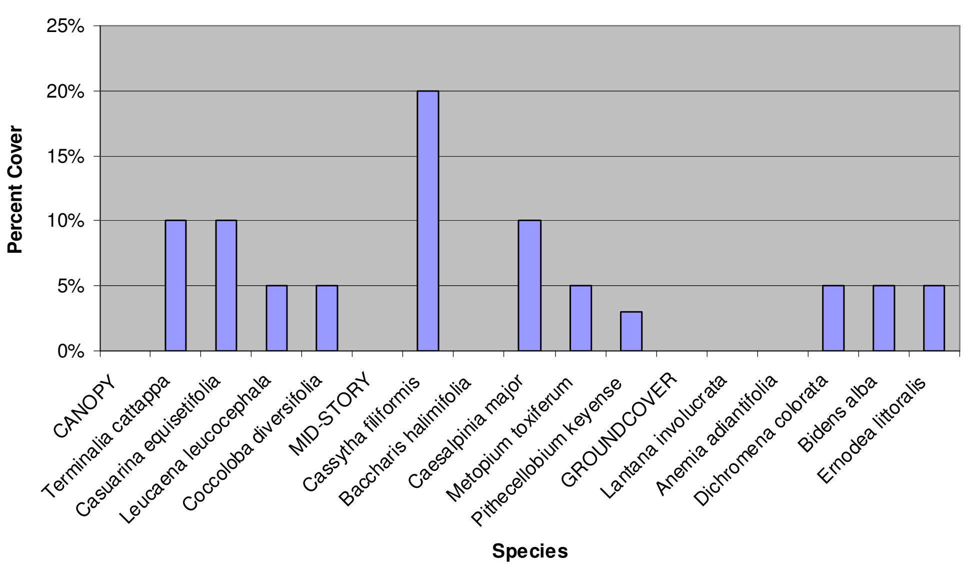
Clusia rosea

Natal grass

Rhynchelytrum repens

This station, located close to the South Ocean road on the wellfield side of the property, is a mixed pine-palm community with fairly open groundcover and sparse canopy.

DATA POINT 2: Disturbed - Casuarina



OCCASIONAL <1%

Blue Porterweed

Stachytarpheta jamaicensis

Ground orchid

Bletia purpurea

Spiciform Milk Pea

Galactia spiciformis

Gumbo limbo

Bursera simaruba

Trema

Trema lamarckianum

Natal grass

Rhynchelytrum repens

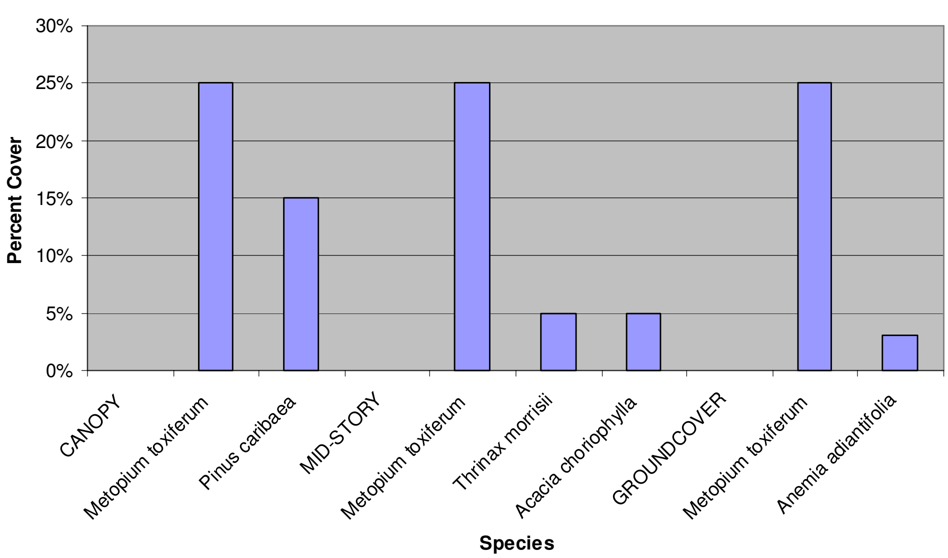
Bushy beard grass

Andropogon glomeratus

This is a disturbed section of land impacted both by exotic invasion and gravel extraction. The photo shows the extent of Love vine proliferation and also Casuarinas and Tropical almond.

DATA POINT 3: Pine

The pinelands in this central portion of the project exhibit a denser canopy and midstory assemblage, illustrating the ecological succession process from pine to broadleaf coppice. Poisonwood was dense in all strata. This area does not appear to have been impacted by gravel extraction or fire, hence the thick midstory growth.



OCCASIONAL <1%

Rams Horn

Pithecellobium keyense

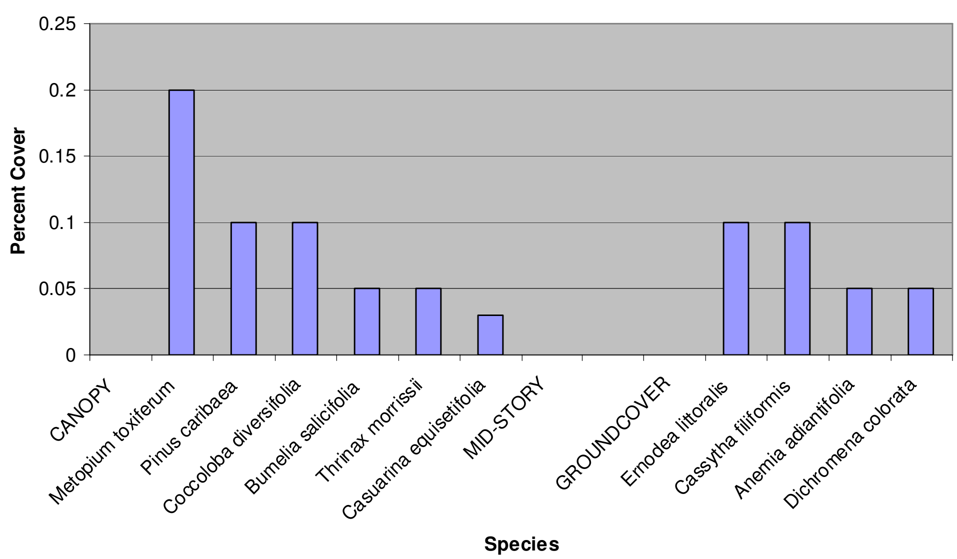
Cocoplum

Chrysobalanus icaco

Mastic

Mastichodendron foetidissimun

DATA POINT 4: Disturbed – Mixed weeds



OCCASIONAL <1%

Cinnecord

Acacia choriophylla

Wild guava

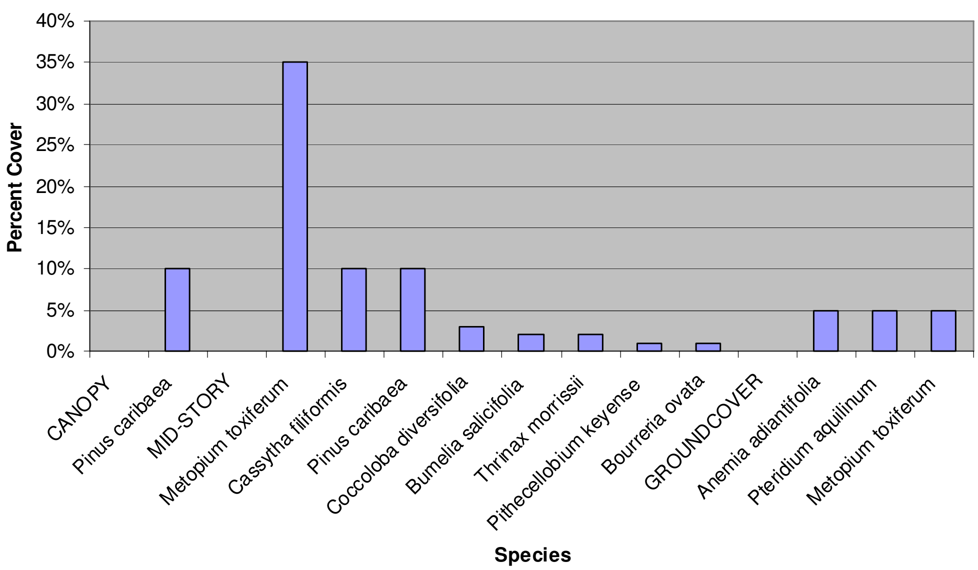
Tetrazygia bicolor

Five finger

Tabebuia bahamensis

To the north of data point 2, this area has been impacted by gravel extraction work and subsequently colonized by Casuarina and other invasives. Midstory species were reduced. An unidentified warbler was heard in the vicinity, most likely a Pine warbler *Dendroica pinus*.

DATA POINT 5: Pine



OCCASIONAL <1%

Wild guava

Tetrazygia bicolor

Five finger

Tabebuia bahamensis

Cinnecord

Acacia choriophylla

Abraham bush

Phyllanthus epiphyllanthus

Feather bed

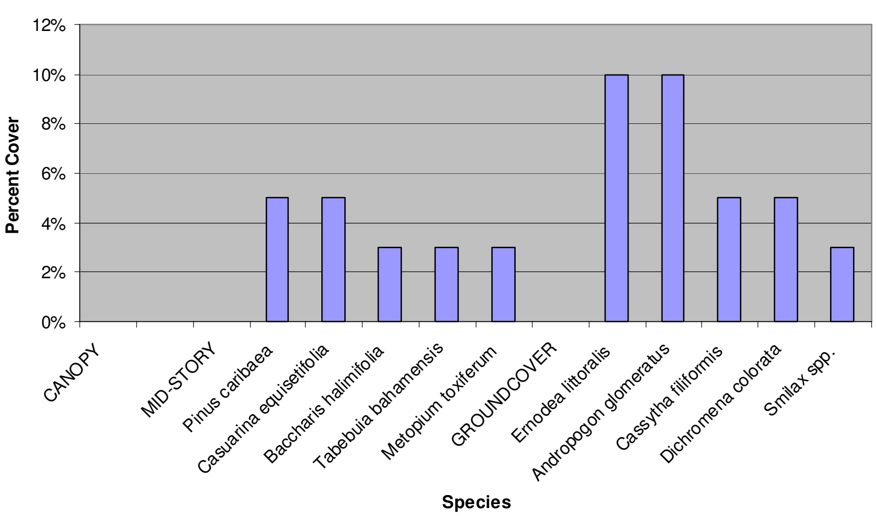
Diospyros crassinervis

Trema

Trema lamarckianum

This station is very similar to data point 3, located in the east central portion of the site, consisting of pine with a varied midstory, typical of the pinelands present on the property.

DATA POINT 6: Disturbed - Pine



OCCASIONAL <1%

Inkberry

Scaevola plumieri

Black torch

Erithalis fruticosa

Wild sage

Lantana involucrata

Locustberry

Byrsonima lucida

Poison cherry

Crossopetalum rhacoma

Velvetseed

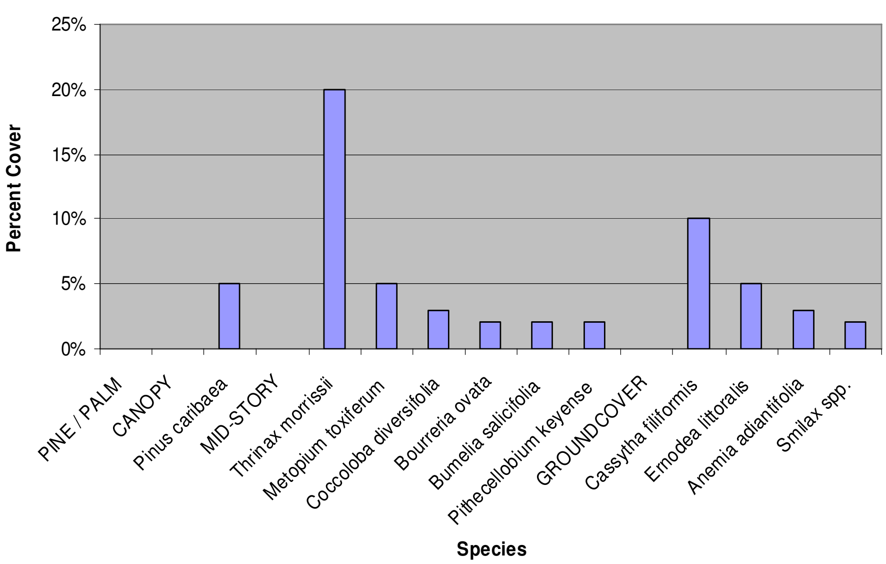
Guettarda scabra

Rams Horn

Pithecellobium keyense

This station is located in the most heavily impacted portion of the property, where gravel extraction has removed most of the natural vegetation and re-growth includes invasives and weed like species. The smaller size of canopy species restricted them to the midstory stratum.

DATA POINT 7: Pine / Palm



OCCASIONAL <1%

Saltbush

Baccharis halimifolia

Wild guava

Tetrazygia bicolor

Feather bed

Diospyros crassinervis

Wild sage

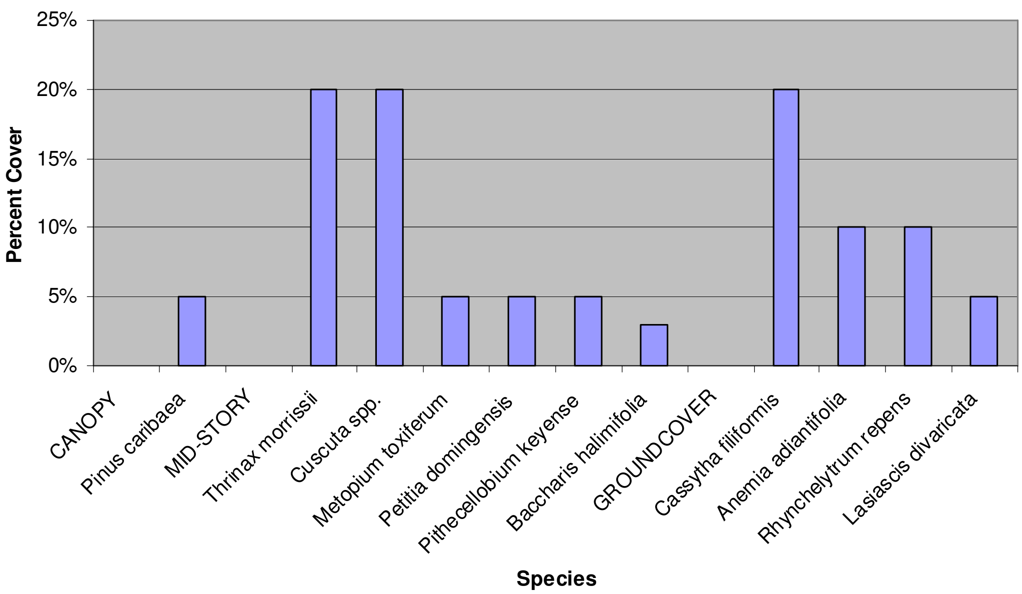
Lantana involucrata

Velvetseed

Guettarda scabra

This is a mixed dry pine habitat which, by virtue of the frequency of Silver thatch palm, is characterized as Pine-palm assemblage. This region has been invaded by Love vine quite significantly, especially in areas closer to the road. A brown rat was observed briefly in this area.

DATA POINT 8: Pine / Palm



OCCASIONAL <1%

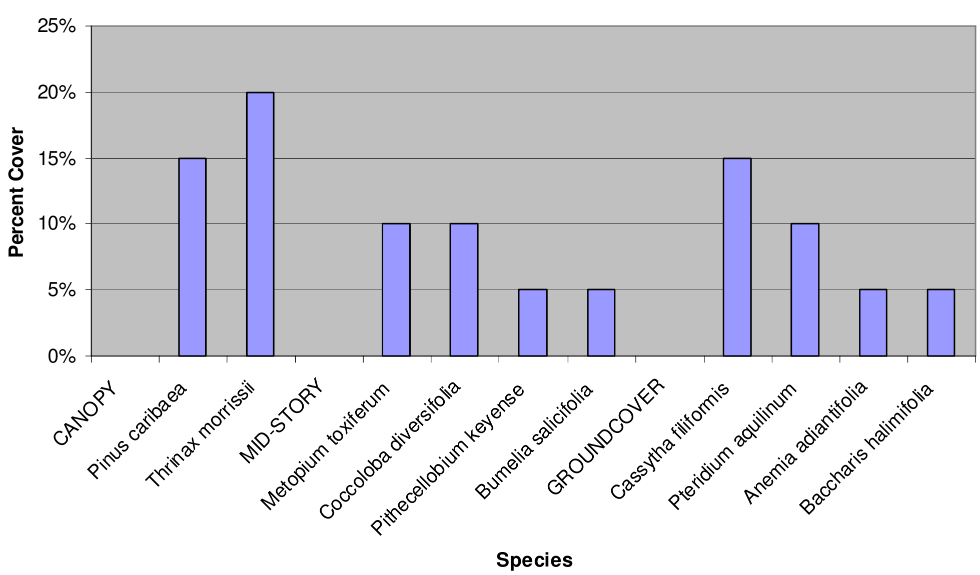
Wild guava

Tetrazygia bicolor

This area close to the northern property boundary has been significantly impacted by weeds, vines and invasive species. Two shiny cowbirds were observed in the vicinity.

DATA POINT 9: Pine / Palm

Further into the interior of the property, this station is also characterized as Pineland with dominant Silver thatch palm. Away from the influence of the road and surrounding development, less exotic invasion was noted. Evidence of previous fires (charred and blackened pine trunks) was observed in the vicinity.



OCCASIONAL <1%

Wild guava

Tetrazygia bicolor

Feather bed

Diospyros crassinervis

Gumbo limbo

Bursera simaruba

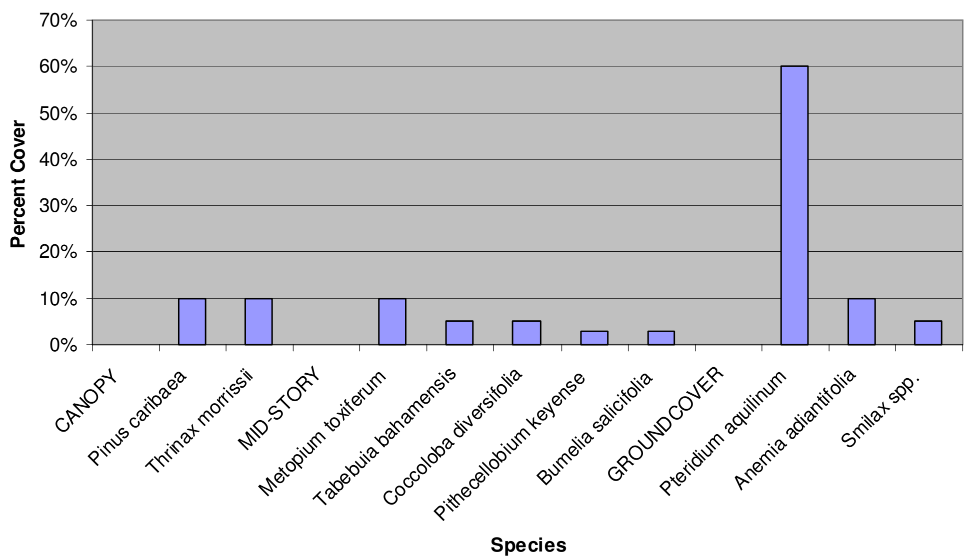
Red stopper

Eugenia rhombea

Wild fig

Ficus citrifolia

DATA POINT 10: Pine



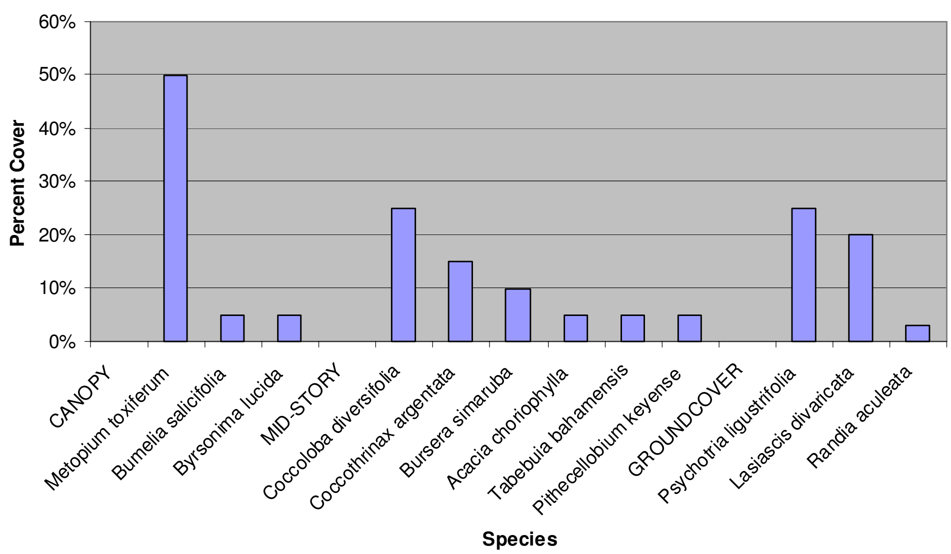
OCCASIONAL <1%

Indigoberry

Randia aculeata

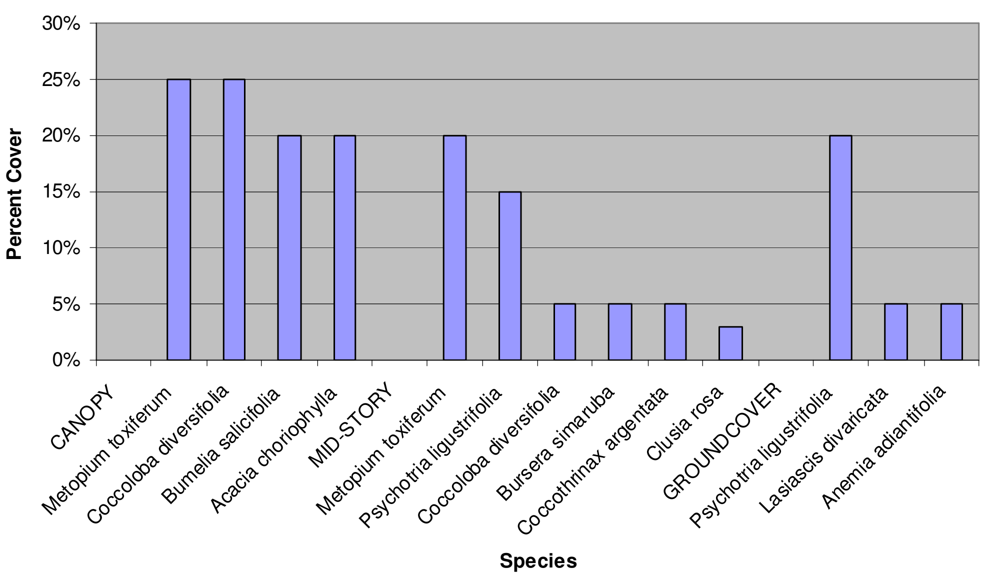
This datapoint, as illustrated by the photograph, is a classic pineland habitat with evidence of fire and dense groundcover of Bracken fern. Also of note were frequent large sinkholes in this area.

DATA POINT 11: Dry Coppice Ridge



Located on a higher elevation ridge feature, this finger extends from the central part of the western property line into the mid area of the site with a mix of evergreen, broadleaf coppice species. A Catbird was heard in this area.

DATA POINT 12: Dry Coppice Ridge



OCCASIONAL <1%

Feather bed

Diospyros crassinervis

Indigoberry

Randia aculeata

Crabwood

Ateramnus lucida

Five finger

Tabebuia bahamensis

Tilandsia

Tilandsia spp.

Rams Horn

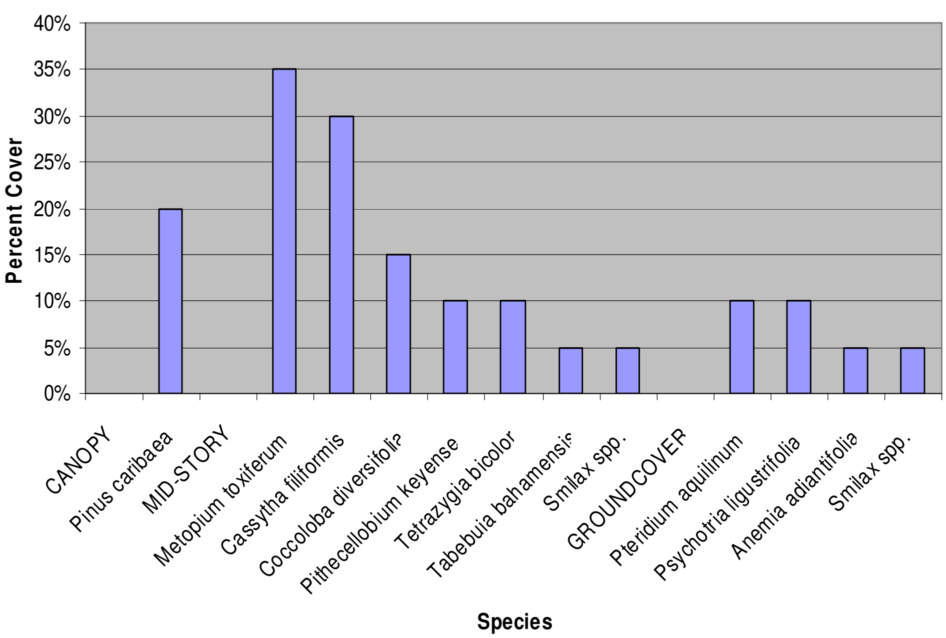
Pithecellobium keyense

Satin leaf

Chrysophyllum oliviforme

This station is located in the same ridge feature as datapoint 11 but closer to the western property line from which it was accessed. A greater species diversity was noted at this locale and a juvenile White crowned pigeon, *Columba leucocephala*, was observed perched in a Pigeon plum tree.

DATA POINT 13: Pine



OCCASIONAL <1%

Feather bed

Diospyros crassinervis

Gumbo limbo

Bursera simaruba

Wild sage

Lantana involucrata

Silver thatch palm

Coccothrinax argentata

Cinnecord

Acacia choriophylla

Wild bamboo

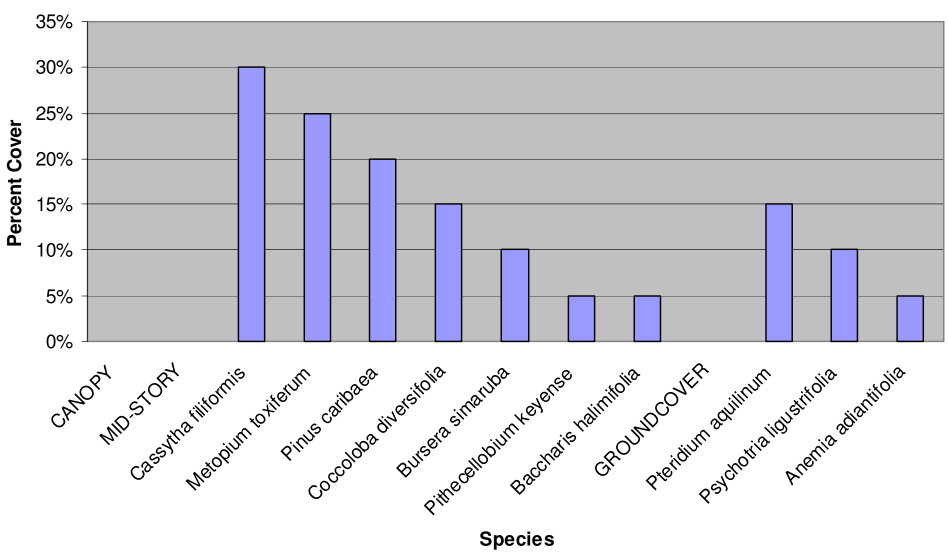
Lasiascis divaricata

Cocobey

Cordia bahamensis

This datapoint exhibits typical dry pineland vegetation composition. Love vine invasion was relatively high. An unidentified bird, most likely an American kestrel, was observed overhead.

DATA POINT 14: Pine – Open Canopy



OCCASIONAL <1%

Cassada wood

Bumelia salicifolia

Wild fig

Ficus citrifolia

Wild sage

Lantana involucrata

Velvetseed

Guettarda scabra

Five finger

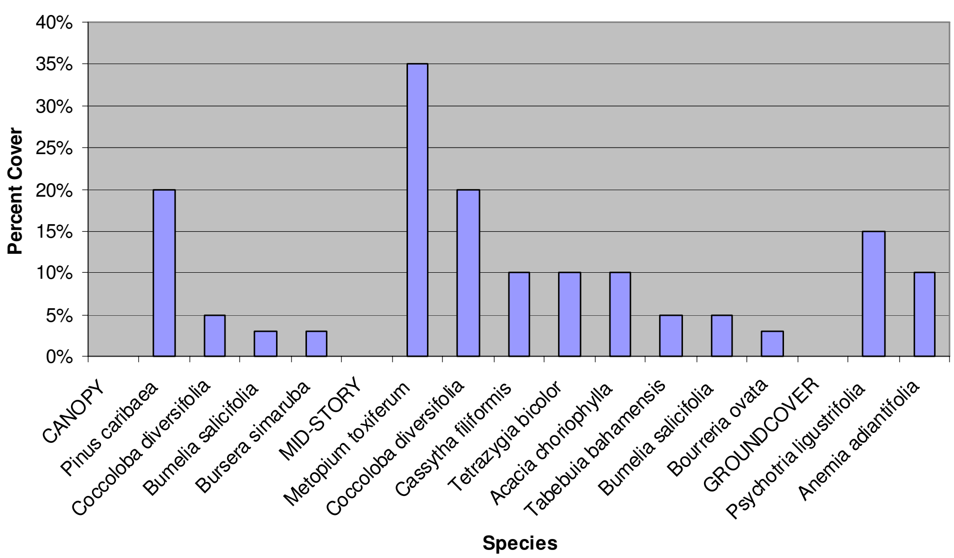
Tabebuia bahamensis

Wild guava

Tetrazygia bicolor

This area is visible as a distinct habitat type on aerial photos and groundtruthing showed a pineland with reduced canopy strata. Dense and varied midstory species assemblage was noted. It may have been previously logged.

DATA POINT 15: Pine



OCCASIONAL <1%

Wild sage

Lantana involucrata

Granny bush

Cordia bahamensis

Smilax

Smilax spp.

Velvetseed

Guettarda scabra

Crabwood

Ateramnus lucida

Bushy beard grass

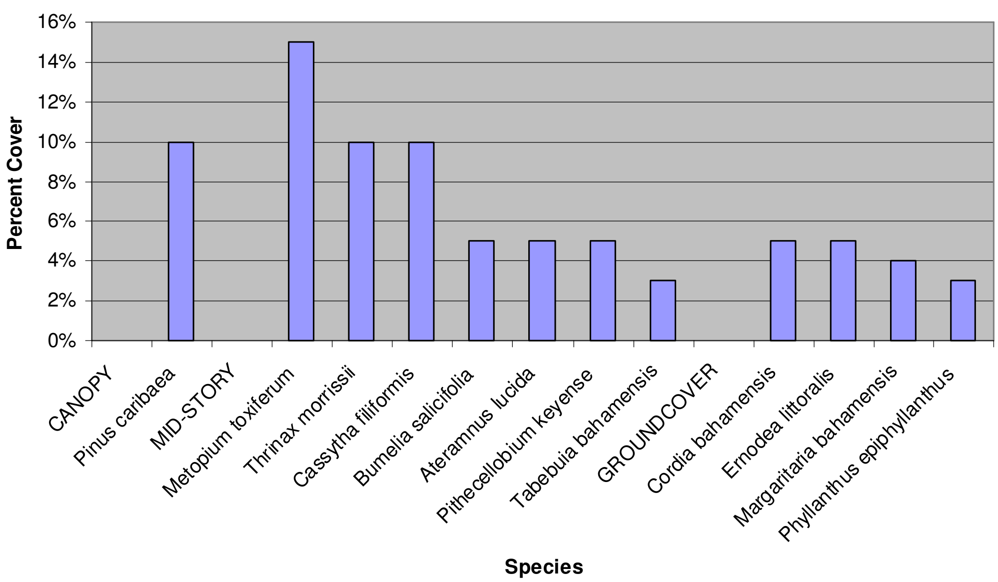
Andropogon glomeratus

Silver thatch palm

Coccothrinax argentata

Typical dry pineland community located in the west central part of the property.

DATA POINT 16: Pine - Palm



OCCASIONAL <1%

Darling plum

Reynosia septentrionalis

Sawgrass

Cladium jamaicense

Pond apple

Annona glabra

Pine fern

Anemia adiantifolia

Wild guava

Tetrazygia bicolor

Saltbush

Baccharis halimifolia

Strongback

Bourreria ovata

Smilax

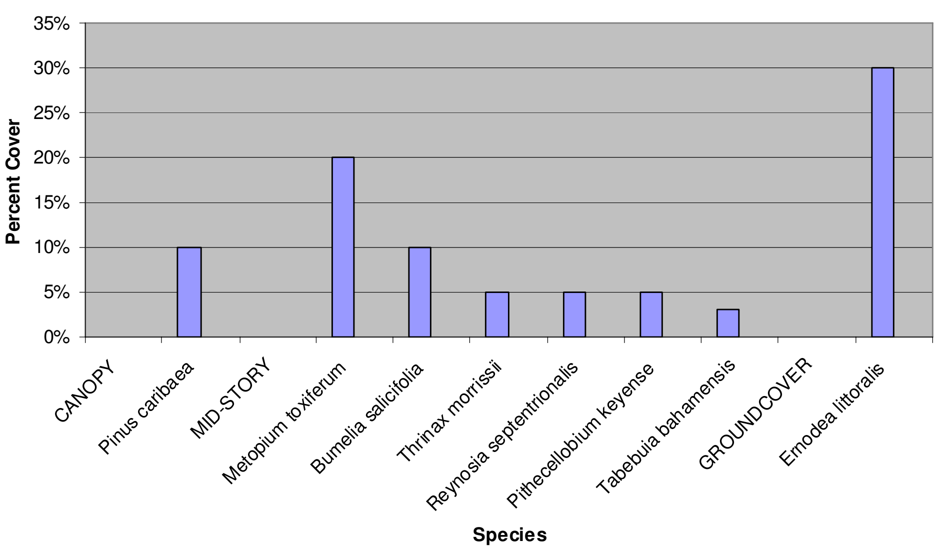
Smilax spp.

Naked wood

Thouinia discolor

Located in the southeastern corner of the Albany House grounds, adjacent to the road that bisects the property, this is a mixed dry pine community with older pines and a diverse midstory and groundcover.

DATA POINT 17: Pine - Palm



OCCASIONAL <1%

Sawgrass

Cladium jamaicense

Primrose willow

Ludwigia octovalvis

Granny bush

Cordia bahamensis

Pigeon plum

Coccoloba diversifolia

Saltbush

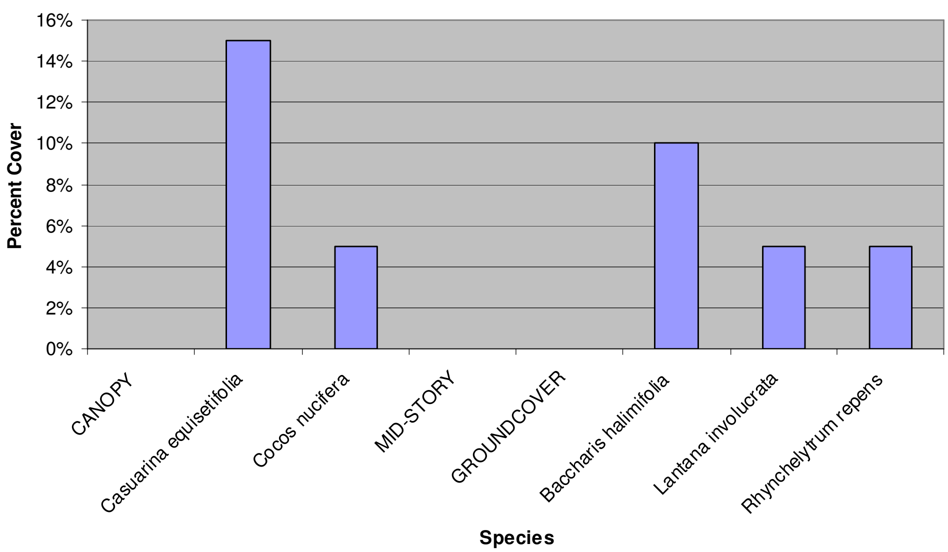
Baccharis halimifolia

Cocoplum

Chrysobalanus icaco

Similar to datapoint 16, this is a typical pineland, impacted by some exotic invasion but with older, although smaller, canopy pines and a diverse species assemblage.

DATA POINT 18: Disturbed - Casuarina



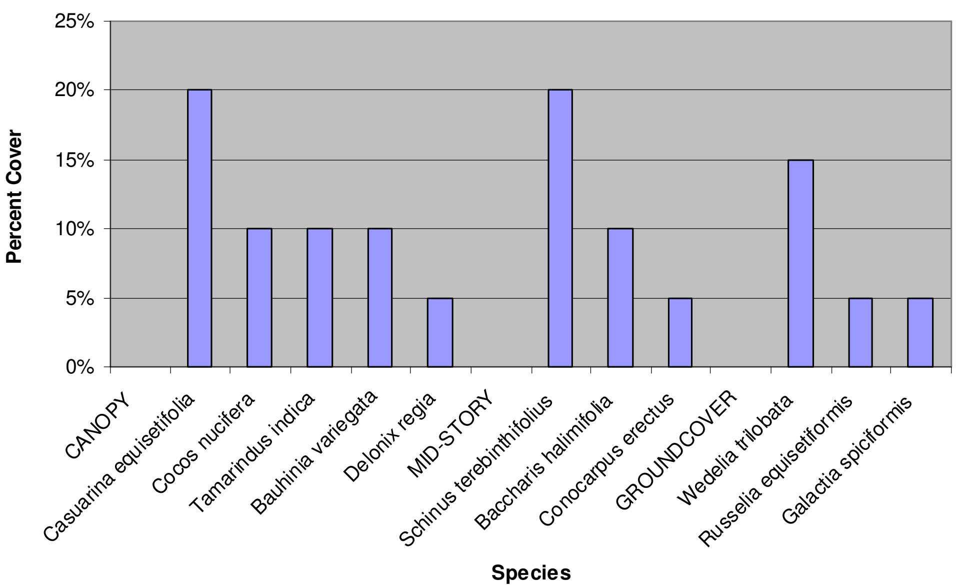
OCCASIONAL <1%

Red cedar

Juniperus barbadensis

Located adjacent to a man-made lake close to the eastern property line within the Albany House grounds, this is a heavily impacted area exhibiting a low species diversity and dominance by the invasive Casuarina.

DATA POINT 19: Disturbed - Casuarina



OCCASIONAL <1%

Bouganvillea

Bouganvillea spectabilis

Shepherds needle

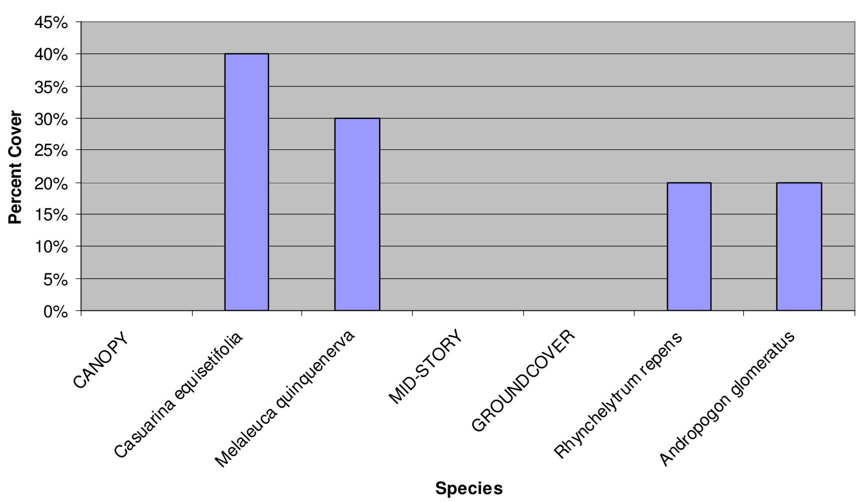
Bidens alba

Bastard stopper

Petitia domingensis

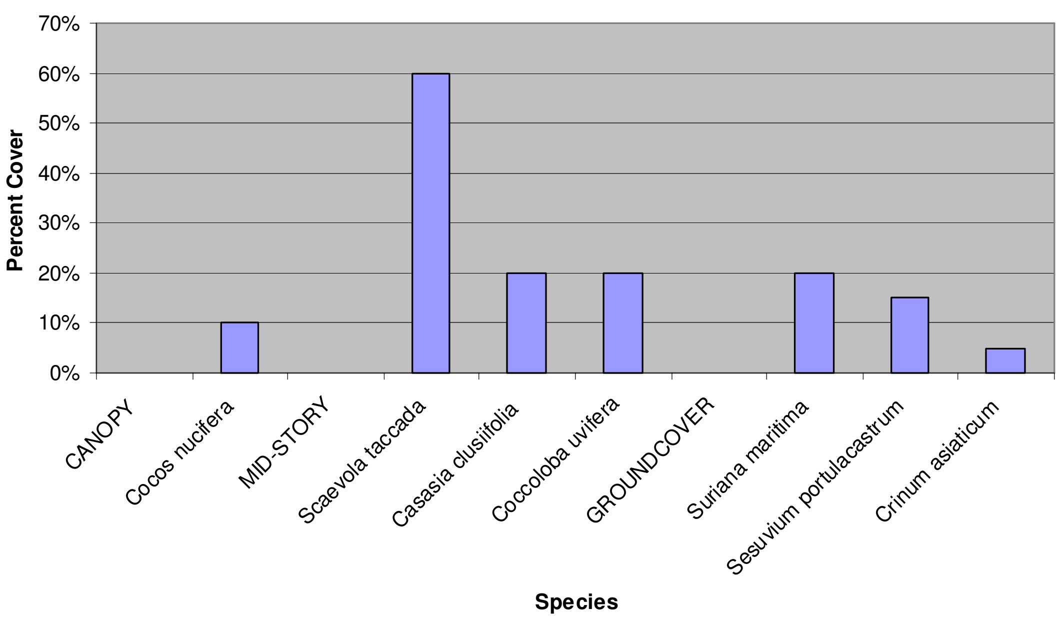
This area has been characterized as disturbed and is dominated by Casuarina. A variety of exotic landscaping species have been planted on this ridge which was created by the piling up of spoil from the adjacent lake excavation. Casuarinas fringe the entire area and remain the dominant canopy species.

DATA POINT 20: Disturbed - Casuarina



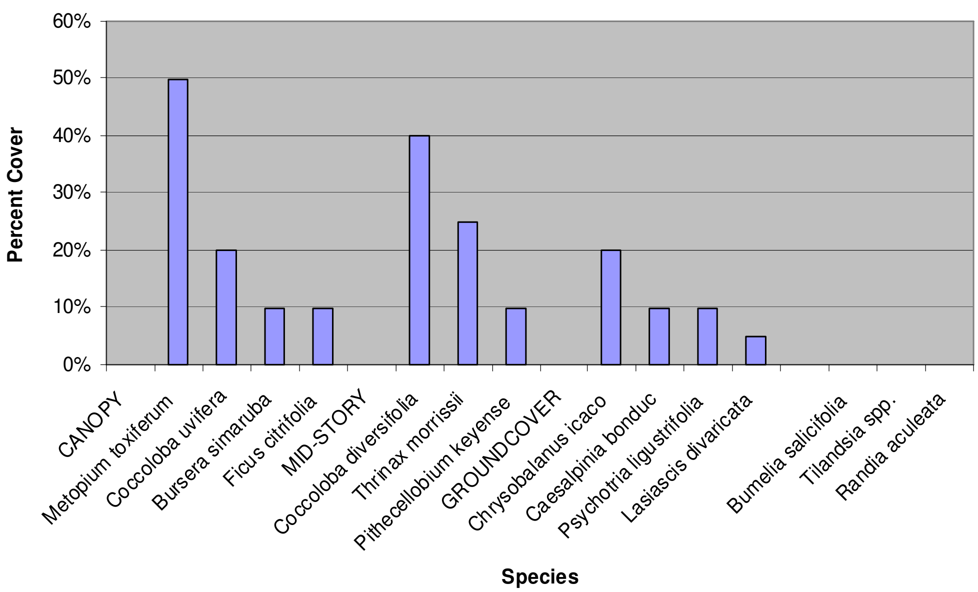
This area adjacent to a second man-made lake within the Albany House grounds, has been completely invaded by Casuarina and Melaleuca.

DATA POINT 21: Coastal Strand



This station illustrates the narrow but well developed strip of coastal vegetation that runs along the entire Albany shoreline. The invasive Beach napauka can be seen in the photograph.

DATA POINT 22: Dry Coppice



OCCASIONAL <1%

Cassada wood

Bumelia salicifolia

Tilandsia

Tilandsia spp.

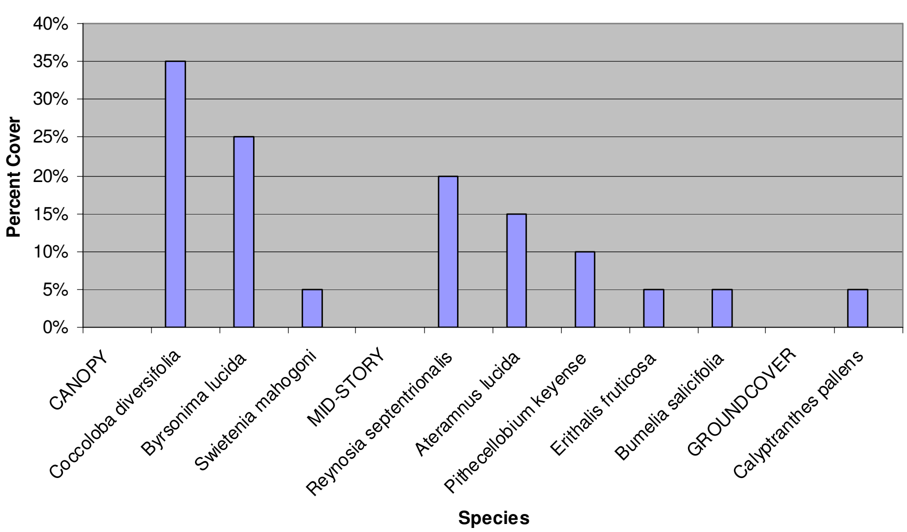
Indigoberry

Randia aculeata

Inland from the coastal strand community this variable dry coppice comprises the majority of the Albany house grounds. A Red leggged thrush was observed in the transition area between this and the coastal strand habitat to the south.

DATA POINT 23: Dry Coppice

This area in the central part of the Albany House grounds is classified as dry coppice and exhibits a diverse and attractive species assemblage including several species (Mahogany, Silver thatch palm and Locustberry) that would be valuable as retained landscape plants.



OCCASIONAL <1%

Silver thatch palm

Coccothrinax argentata

Rooster comb

Zanthoxylum coriaceum

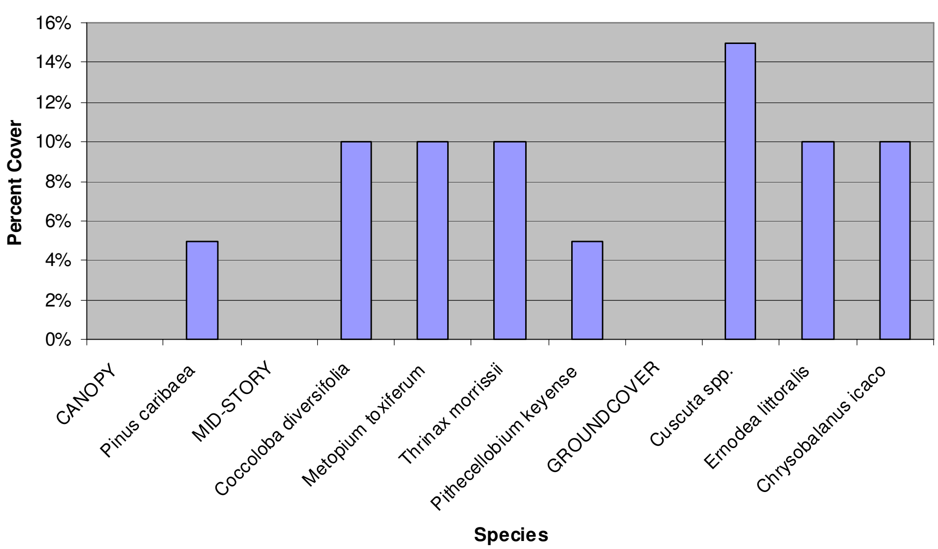
Orchids

Encyclia spp.

Tilandsia spp.

DATA POINT 24: Pine - Palm

This data point is located on the northern side of one of the paths through the Albany House grounds, a line which delineates between pine-palm and dry coppice habitats. The station is located within the pine-palm assemblage and is a diverse mix with several broadleaf species noted.



OCCASIONAL <1%

Mahogany

Swietenia mahogoni

Marsh fleabane

Pluchea odorata

Saltbush

Baccharis halimifolia

Velvetseed

Guettarda scabra

Cassada wood

Bumelia salicifolia

Cinnecord

Acacia choriophylla

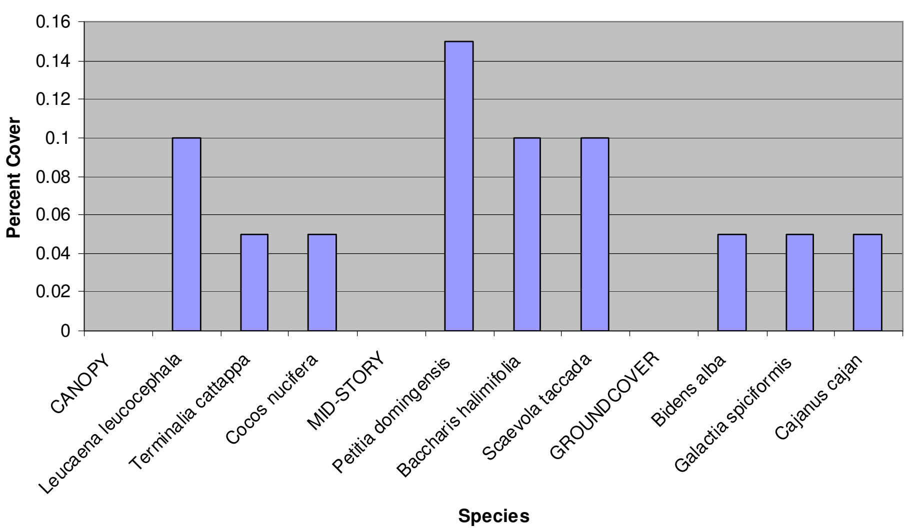
Strongback

Bourreria ovata

Five finger

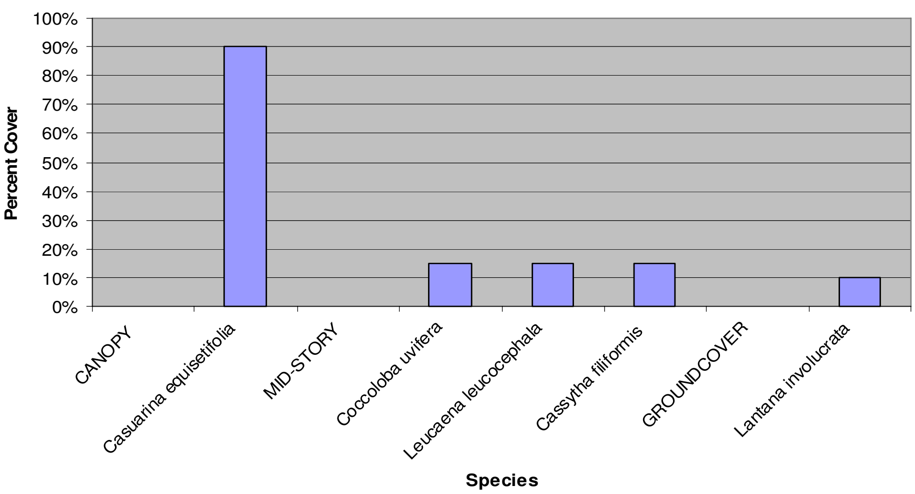
Tabebuia bahamensis

DATA POINT 25: Disturbed – Mixed weeds



This station is located within an area that has been used as a refuse site for landscape waste, consequently a variety of nuisance, exotic species have colonized the area.

DATA POINT 26: Disturbed - Casuarina



OCCASIONAL <1%

Cocoplum

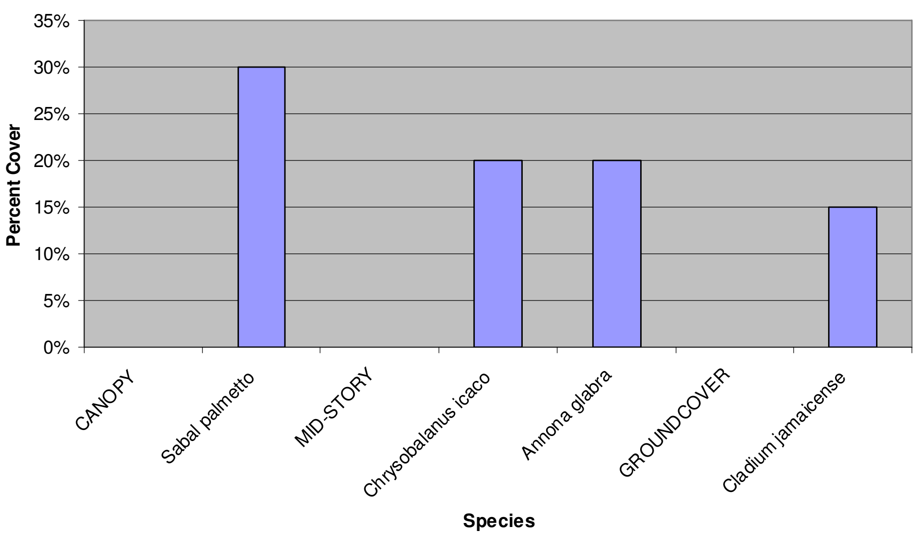
Chrysobalanus icaco

Sawgrass

Cladium jamaicense

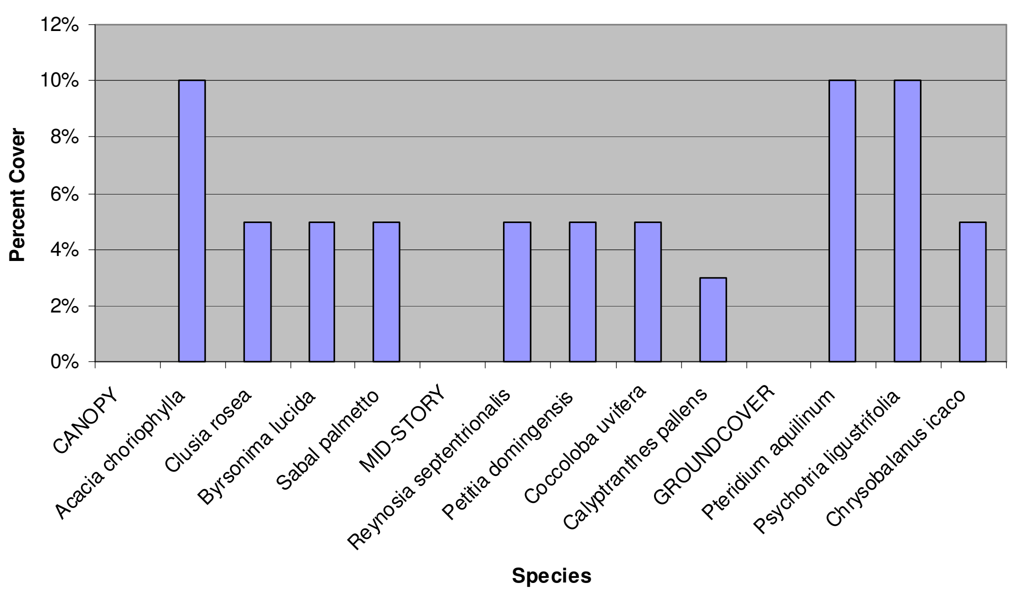
As illustrated in the photograph, this large area is almost completely dominated by Casuarina and makes up a significant section of the mid-part of the Albany House grounds. This datapoint is located at the edge of a second man-made lake on the property. A raccoon, *Procyon lotor*, was observed across the lake.

DATA POINT 27: Cabbage Palm



This datapoint is located within a depresssional strand that runs through the larger, Casuarina dominated, area. This is a freshwater wetland with black, mucky soils approximately 3" deep.

DATA POINT 28: Dry Coppice

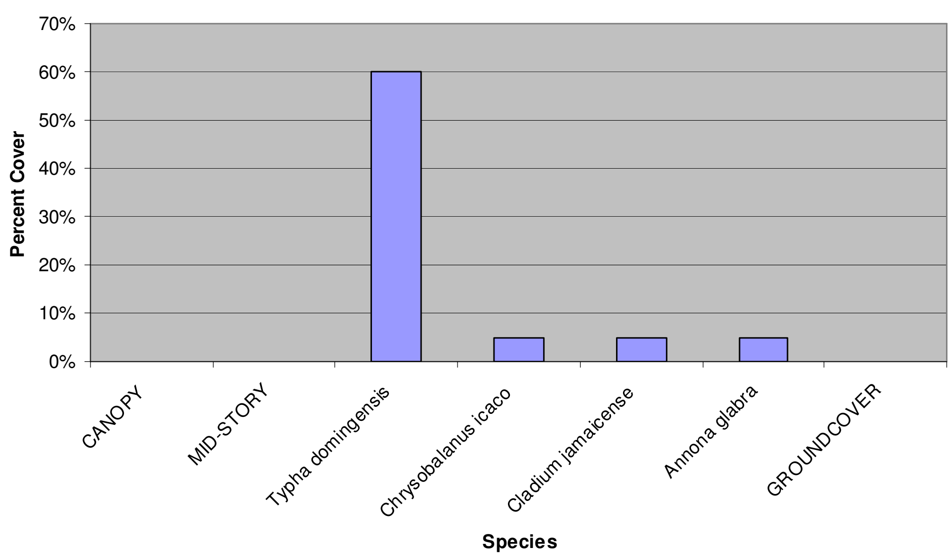


This dry coppice area represents a transitional area with a very mixed species assemblage, characterized as evergreen, broadleaf dry coppice.

OCCASIONAL <1%

Poisonwood
Metopium toxiferum
Featherbed
Diospyros crassinervis
Abraham bush
Phyllanthus epiphyllanthus
Smilax
Smilax spp.
Velvetseed
Guesttarda scabra
Indigoberry
Randia aculeata
Wax myrtle
Myrica cerifera
Gumbo limbo
Bursera simaruba
Pigeon plum
Coccoloba diversifolia
Casuarina
Casuarina littorea

DATA POINT 29: Cattail Marsh



OCCASIONAL <1%

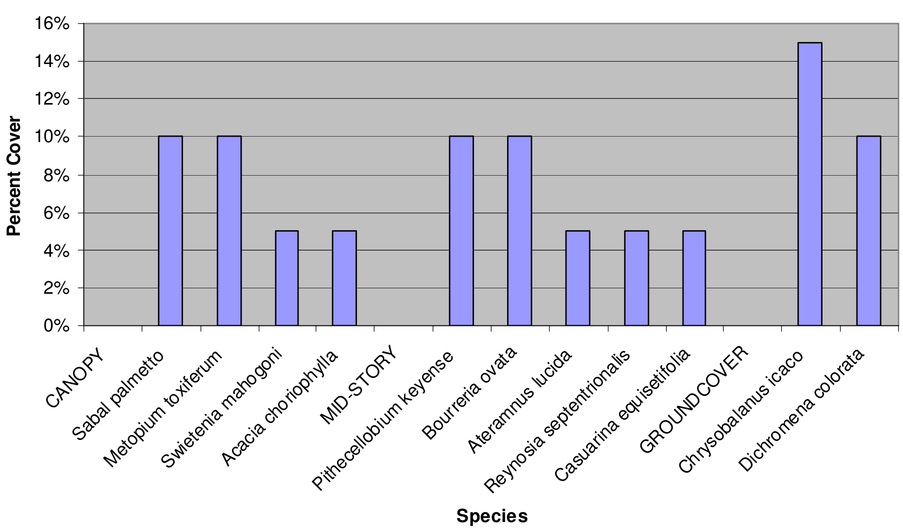
Wax myrtle

Myrica cerifera

This station is located in depressional pond that runs in a narrow strip along the edge of a pathway leading from the Albany House beach house. Flagstones have been laid as pathway over this habitat leading to a small gazebo. The black, mucky substrate was estimated to be more than 3' deep.

DATA POINT 30: Dry Coppice

This is a diverse, transitional area just north of the cattail pond, with a variety of broadleaf species.



OCCASIONAL <1%

Velvetseed

Guesttarda scabra

Beakrush

Cyperus spp.

Sawgrass

Cladium jamaicense

Cattail

Typha domingensis

Indigoberry

Randia aculeata

Bastard Stopper

Petitia domingensis

Feather bed

Diospyros crassinervis

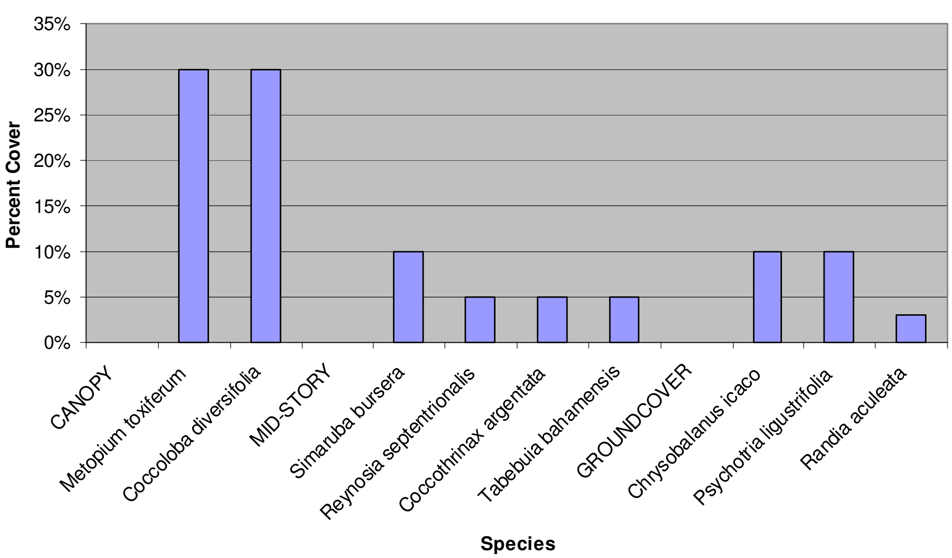
Pitch apple

Coccoloba diversifolia

Five finger

Tabebuia bahamensis

DATA POINT 31: Dry Coppice



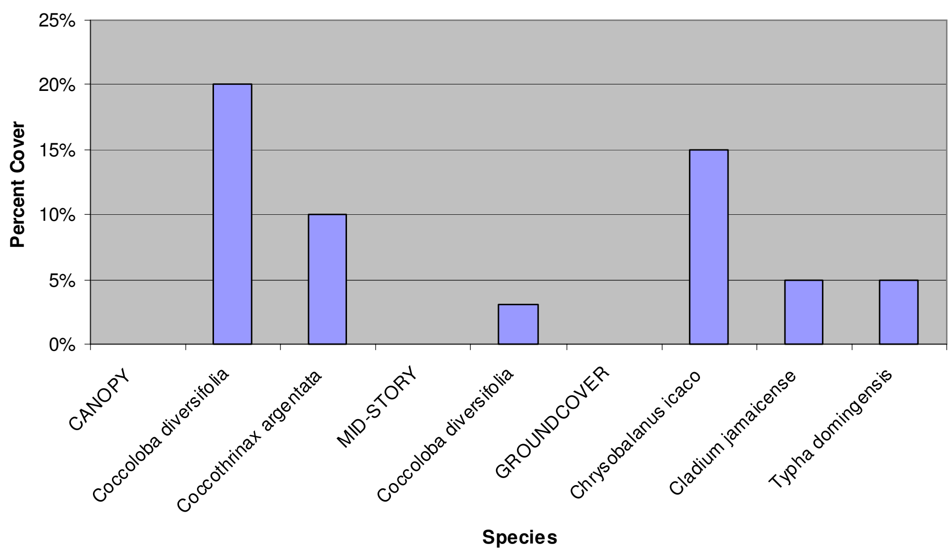
OCCASIONAL <1%

Mahogany

Swietenia mahogoni

Located behind the staff quarters of the Albany House grounds, this datapoint is within the dry coppice community type. A mocking bird and the remains of a dead raccoon were observed in the vicinity.

DATA POINT 32: (Depressional) Cattail



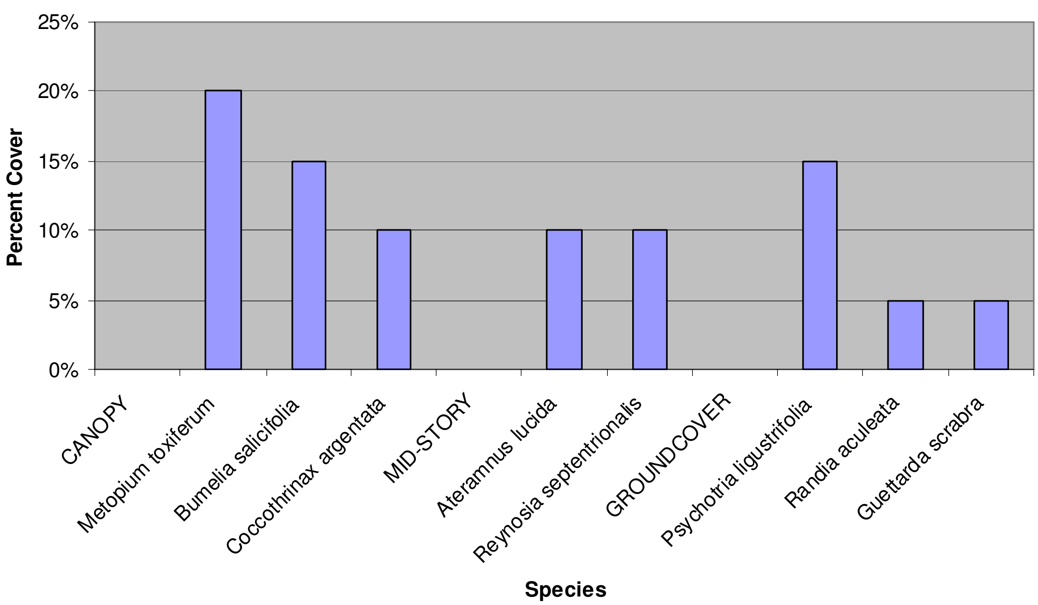
OCCASIONAL <1%

Pond apple

Annona glabra

This datapoint is located in a transition zone between the depressional cattail area noted in datapoint 29 and the surrounding pine and dry coppice. Surface water influence is illustrated by the species assemblage, specifically Cattail, Sawgrass and Pond apple.

DATA POINT 33: Dry Coppice



OCCASIONAL <1%

Cinnecord

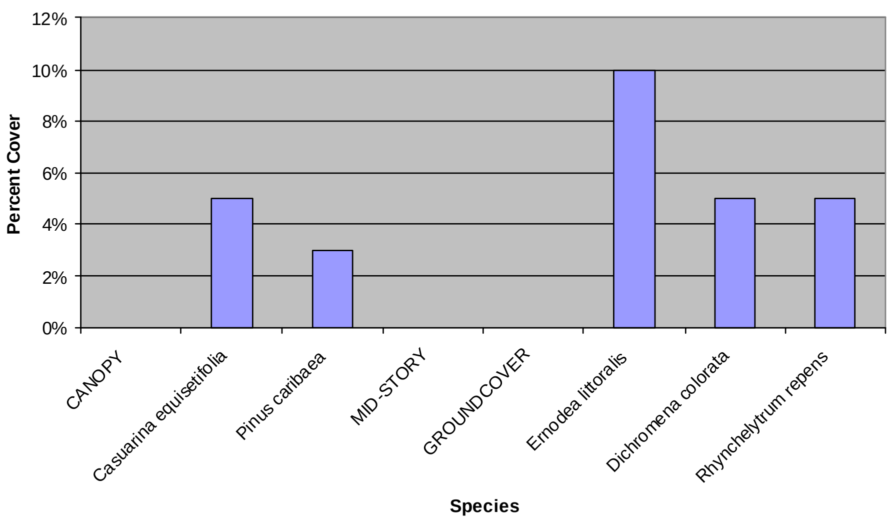
Acacia choriophylla

Cocoplum

Chrysobalanus icaco

Immediately across the pathway from datapoint 32, the habitat type is again classified as dry coppice with a mixed broadleaf assemblage.

DATA POINT 34: Disturbed - Pine



Located in the previously excavated area in the northeastern portion of the site, this is a disturbed area where much of the landform is open. A few islands of the natural vegetative communities remain, left most likely because they exist in areas of harder rock substratum.

OCCASIONAL <1%

Grannybush

Cordia bahamensis

Poisonwood

Metopium toxiferum

Smilax

Smilax spp.

Pine fern

Anemia adiantifolia

Orchid

Bletia purpurea

Saltbush

Baccharis halimifolia

Cassada wood

Bumelia salicifolia

Five finger

Tabebuia bahamensis

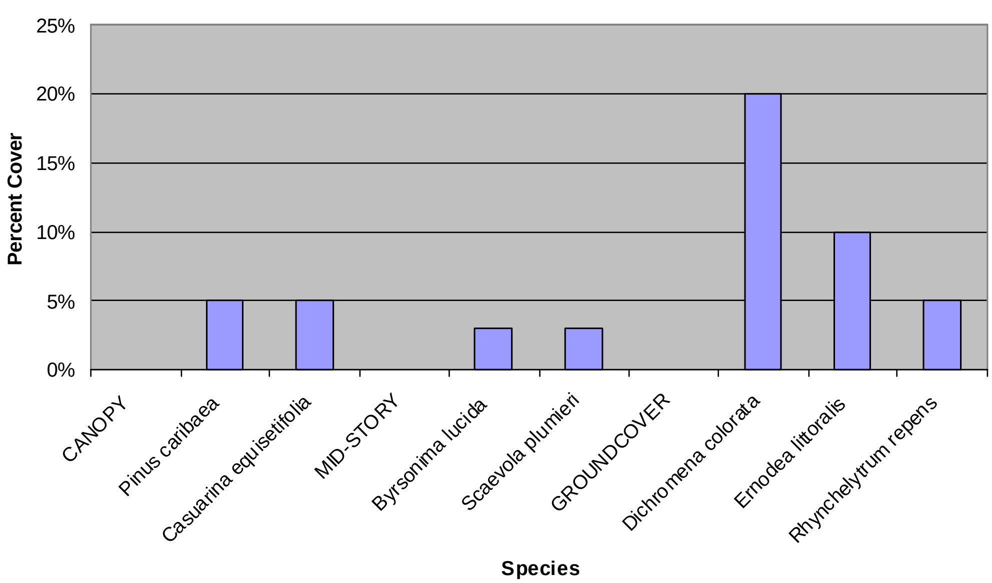
Rams horn

Pithecellobium keyense

Love vine

Cuscuta spp.

DATA POINT 35: Disturbed - Pine



OCCASIONAL <1%

Grannybush

Cordia bahamensis

Poisonwood

Metopium toxiferum

Smilax

Smilax spp.

Pine fern

Anemia adiantifolia

Orchid

Bletia purpurea

Saltbush

Baccharis halimifolia

Cassada wood

Bumelia salicifolia

Five finger

Tabebuia bahamensis

Rams horn

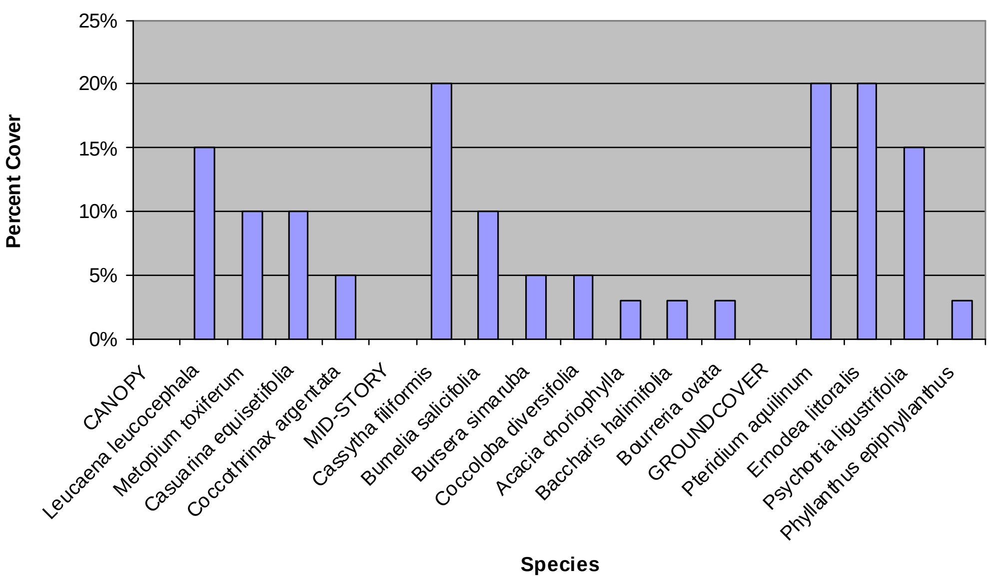
Pithecellobium keyense

Love vine

Cuscuta spp.

This datapoint is located close to the northern property line in the previously excavated pineland. Species composition and site characteristics are very similar to the preceding station.

DATA POINT 36: Disturbed – Mixed weeds



OCCASIONAL <1%

Rams Horn

Pithecellobium keyense

Nakedwood

Thouinia discolor

Darling plum

Reynosia septentrionalis

Sawgrass

Cladium jamaicense

Smilax

Smilax spp.

Bacopa

Bacopa monnieri

Pitch apple

Clusia rosea

Bastard Stopper

Petitia domingensis

Wild sage

Lantana involucrata

This is a mixed, disturbed area surrounded by roads on two sides and a private residence on one. The species assemblage is typical of a roadside community with Love vine, Casuarina and Jumbey as dominant species.

APPENDIX VI

FLORAL INVENTORY

ALBANY FLORAL INVENTORY

Scientific Name	Common Name
Acacia choriophylla	Cinnecord
Acacia auriculiformis	Earleaf acacia
Acrostichum spp.	Leather fern
Andropogon glomeratus	Bushy beard grass
Anemia adiantifolia	Pine fern
Annona glabra	Pond apple
Ateramnus lucida	Crabwood
Baccharis halimifolia	Saltbush
Bacopa monnieri	Bacopa
Bauhinia variegata	Orchid tree
Bidens alba	Shepherds needle
Bidens alba	Shepherds needle
Bletia purpurea	Ground orchid
Bletia purpurea	Orchid
Borrichia arborescens	Sea oxeye daisy
Bouganvillea spectabilis	Bouganvillea
Bourreria ovata	Strongback
Bumelia salicifolia	Cassada wood
Bursera simaruba	Gumbo limbo
Byrsonima lucida	Locust berry
Caesalpinia bonduc	Gray nickerbean
Cajanus cajan	Pigeon pea
Cajanus cajan	Pigeon pea
Calyptranthes pallens	Spiceflower
Calyptranthes pallens	Spicewood
Casasia clusiifolia	Seven year apple
Cassytha filiformis	Love vine
Casuarina equisetifolia	Australian pine
Chrysobalanus icaco	Cocoplum
Chrysophyllum oliviforme	Satin leaf
Cladium jamaicense	Sawgrass
Clusia rosea	Pitch apple
Coccoloba diversifolia	Pigeon plum
Coccoloba uvifera	Seagrape
Coccothrinax argentata	Silver thatch palm
Cocos nucifera	Coconut
Conocarpus erectus	Green buttonwood
Cordia bahamensis	Cocobey
Cordia bahamensis	Granny bush
Crossopetalum rhacoma	Poison cherry
Cyperus spp.	Beakrush
Dactyloctenium aegyptium+B59	Crowfoot grass
Davallia fejeensis	Rabbits foot fern
Delonix regia	Royal Poinciana
Dichromena colorata	Star sedge
Diospyros crassinervis	Featherbed
Diospyros crassinervis	Stiff cock

Encyclia rufa	Orchid
Encyclia spp.	Orchids
Erithalis fruticosa	Black torch
Ernodea littoralis	Golden Beach Creeper
Eugenia rhombea	Red stopper
Ficus citrifolia	Wild fig
Foresteria segretata	Privet
Galactia spiciformis	Spiciform Milk Pea
Guapira discolor	Blolly
Gyminda latifolia	Boxwood
Hymenocallis arenicola	Spider lily
Juniperus barbadensis	Red cedar
Lantana involucrata	Wild sage
Lasiascis divaricata	Wild bamboo
Leucaena leucocephala	Jumbey
Ludwigia octovalvis	Primrose willow
Mallatonia gnaphaloides	Sea Lavender
Margaritaria bahamensis	Sweet margeret
Margariteria bahamensis	Sweet Margaret
Mastichodendron foetidissimun	Mastic
Melaleuca quinquenerva	Melaleuca
Metopium toxiferum	Poisonwood
Mikania scandens	Hemp vine
Myrica cerifera	Wax myrtle
Myriophyllum heterophyllum	Water millfoil
Passiflora cupraea	Passion flower
Petitia domingensis	Bastard Stopper
Phyllanthus epiphyllanthus	Abraham bush
Pinus caribaea	Pine
Pithecellobium keyense	Rams Horn
Pluchea odorata	Marsh fleabane
Pontederia cordata	Pickerel weed
Psychotria ligustrifolia	Wild coffee
Pteridium aquilinum	Bracken fern
Randia aculeata	Indigo berry
Reynosia septentrionalis	Darling plum
Rhynchelytrum repens	Natal grass
Rivina humilis	Rougeberry
Russelia equisetiformis	Firecracker bush
Rynchospora spp.	Rynchospora
Sabal palmetto	Cabbage palm
Scaevola plumieri	Inkberry
Scaevola taccada	Beach napauka
Schinus terebinthifolius	Brazilian pepper
Sesuvium portulacastrum	Sea purslane
Setaria spp	Foxtail grass
Shefflera actinophylla	Shefflera
Smilax spp.	Smilax
Solanum	Bahama nightshade
Spartina patens	Spartina

Stachytarpheta jamaicensis	Blue Porterweed
Suriana maritima	Bay cedar
Swietenia mahogoni	Mahogany
Tabebuia bahamensis	Five finger
Tamarindus indica	Tamarind
Terminalia cattappa	Tropical almond
Tetrazygia bicolor	Wild guava
Thespesia populnea	Seaside mahoe
Thouinia discolor	Nakedwood
Thrinax morrisii	Thatch palm
Tilandsia spp.	Tilandsia
Toxicodendron radicans	Poison ivy
Trema lamarckianum	Trema
Typha domingensis	Cattail
Vanilla barbellata	Vanilla orchid
Waltheria bahamensis	Waltheria
Wedelia trilobata	Wedelia
Woodwardia spp	Chain fern
Zanthoxylum coriaceum	Hercules club

APPENDIX VII

EIA SUPPLEMENT FIGURES

FIGURE 1

ALBANY
Nassau, Bahamas
Lake Location Plan

NORTH

SCALE

SHEET
1


ALBANY
MARINA
1,700ft.
ADELAIDE
CREEK
To Albany Marina
6,800ft.
To Adelaide Creek Channel
ADELAIDE
CREEK
ADELAIDE CREEK
CHANNEL

FIGURE 2


EAST ADELAIDE BEACH EROSION ILLUSTRATION
1942 ADELAIDE BEACH SUBDIVISION
Adelaide Creek
Adelaide Creek
Mouth of Adelaide Creek
NOW NON EXISTANT
MAY BE IN SOME MORE
THIS ROAD RESERVATION NO LONGER IN EFFECT - ONLY EXISTS RIGHT DOWN TO LOT 14 - THE LOT BOUNDARY IS PRACTICALLY AT H.W.M.
ALL WASHED OUT
ALL WASHED OUT
ALL WASHED OUT
ALL WASHED OUT
INTO MODERN H.W.M. OR WORSE
The Sea
LEGEND
CURRENT HIGH WATER MARK (ESTIMATE)
ERODED PROPERTY
HISTORICAL 20' WIDE ROAD RESERVATION

FIGURE 3A


The
Sea
FIGURE 3B

CLASS	LENGTH	MAX BEAM	SLIPS
A	50	19.5	39
B	60	20.5	11
C	70	22.5	7
D	80	23.0	6
E	90	24.5	9
F	100	29.5	8
D	150	44.5	3
E	200	49.5	2
F	240	54.5	2
TOTAL SLIPS			87

FIGURE 4

CONSERVATION AREA
NATURAL BUFFER AREAS
GREEN SPACE

0 100 200 400
SCALE IN FEET

ALBANY

DESIGNED	T.T.T.	REVISION	DWG NAME	Habitat
DRAWN	SS	06-21-05	SHEET	1/8
DATE	01-31-05	N/A	SCALE	1"=200'
JOB NO.	0485	N/A		

SECTION- TOWNSHIP- RANGE-

Turrell & Associates, Inc.
Marine & Environmental Consulting
3584 Exchange Ave. Suite B. Naples, FL 34104-3732
Phone: (239) 643-0166 Fax: (239) 643-6632

FIGURE 5

TOPOGRAPHIC ELEVATION (REFERENCED IN FEET ABOVE MSL)

0 300 600 1,200
SCALE IN FEET

ALBANY

I.4 - SITE DEVELOPMENT PLAN

DESIGNED	T.T.T.	REVISION	DWG NAME	Habitat
DRAWN	SS	08-21-05	SHEET	I.4
DATE	01-21-05	N/A	SCALE	1"=600'
JOB NO	0485	N/A		

SECTION- TOWNSHIP- RANGE-

Turrell & Associates, Inc.
Marine & Environmental Consulting
3584 Exchange Ave. Suite B. Naples, FL 34104-3732
Email: tuna@turrell-associates.com Phone: (239) 643-0166 Fax: (239) 643-6632

Revised 05/93

SPECIFICATIONS - DETAILED PROVISIONS
Section 02598 - Pond Lining - Clay and Flexible Membrane

CONTENTS

SECTION 02598
POND LINING - CLAY AND FLEXIBLE MEMBRANE

PART 1 - GENERAL

1.01 DESCRIPTION
Under these specifications, the contractor shall furnish all labor, material, and tools required for the complete installation of an impermeable storage pond liner as hereinafter described.

The types of liners in this specification are:

A. Clay
B. High Density Polyethylene Geo-membrane
C. Composite Liner (Geo-Seal)

1.02 QUALITY ASSURANCE
Includes the requirements of this specification, the liner manufacturer, and the requirements of the latest revision of the following standards as applicable. Unless specifically stated otherwise, the most stringent requirement will govern when there is a conflict.

ASTM	A-564	ASTM	D-1505
	D-413		D-1557
	D-638		D-1593
	D-746		D-1603
	D-751		D-1693
	D-1004		D-2136
	D-1149		D-3083
	D-1203		FTSM-101B
	D-1204		

1.03 SUBMITTALS
The contractor shall submit for EMWD approval clay samples and samples of any material not specifically noted in the specifications. Unless the material is specifically noted in the specifications, a minimum of six (6) 8"x10" samples of fabricated liner material with material and performance properties shall be submitted. Laboratory tests shall accompany any clay sample indicating conformance to the specifications.

1.04 PRODUCT DELIVERY
All lining materials shall be delivered to the jobsite. During transit, all applicable rules and regulations must be followed. Jobsite storage and handling shall not create a nuisance nor damage the lining materials.

1.05 JOB CONDITIONS
Lining materials shall not be fabricated, stored, or installed in climatic conditions that will adversely affect the quality of the finished lined storage pond.

1.06 ALTERNATIVES
Linings other than those specified shall be submitted well in advance of bid opening with sufficient technical data for an item-by-item comparison of the material properties and performance characteristics. A list of users, including contact persons and phone numbers, is required for consideration of any fabricated lining material.

1.07 WARRANTY

A. Warranty of Lining Material. Fabricated flexible lining materials, shall be guaranteed in writing by the manufacturer or supplier on a pro-rata basis for a period of twenty (20) years. The guarantee shall be against manufacturing defects of workmanship and against deterioration due to ozone, ultraviolet or other normal weather aging. The guarantee shall be limited to replacement of material only and shall not cover installation of said material, vandalism, acts of animals, or earthquakes and other unusual acts of God.

B. Guarantee of Work. The Contractor shall guarantee the entire Work constructed by him under the Contract to be free of defects in materials and workmanship for a period of two (2) years following the date of acceptance of the Work by the District. The Contractor shall agree to make, at his own expense, any repairs or replacements made necessary by defects in materials or workmanship in the Work which become evident within said guarantee period. The Contractor shall make repairs and replacements promptly upon receipt of written order from the District. If the Contractor fails to make the repairs and replacements promptly, the District may do so, and the Contractor shall be liable to the District for the cost of such repairs and replacements.

1.08 EXPERIENCE OF CONTRACTOR
The Contractor installing fabricated flexible liner shall have demonstrated his ability to perform this Work by having previously successfully installed, in hydraulic structures, a minimum of 1,000,000 square feet of similar type flexible linings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Clay shall be equivalent to that available at the Pacific Clay Products Plant in Alberhill, California, with the following properties:

1. Unified Soil Classification "CL".

2. Liquid limit between 25 and 40.

3. Plasticity Index between 20 and 30.

4. Impervious to flow of water when a 12" thick layer is compacted to 90% relative compaction per ASTM D-1557.

B. High Density Polyethylene Geomembrane shall conform to 40 ~~60~~ mil Poly-Flex, as available from Poly-America, Inc., Schlegel Lining Technology, Inc., Gundle Lining Systems or approved equal. The technical data is as follows:

	PROPERTY	TEST METHODS		
1	Dimensions	ASTM D1593	~~60 ± 10 mils~~	40 mils
2	Density (minimum)	ASTM D1505	~~.940~~	
3.	Tensile Properties	ASTM D638		
	a) Tensile Strength at Yield (pounds/inch width)		~~150~~	
	b) Tensile Strength at Break (pounds/inch width)		~~240~~	
	c) Elongation at Break (percent)		~~600% min.~~	
	d) Elongation at Yield (percent)		~~10% min.~~	
	e) Modulus of Elasticity (pounds/square inch)		~~80,000~~	
4.	Tear and Impact Properties			
	a) C-Tear Strength	ASTM D1004	~~90~~	
	b) Puncture Resistance	FTMS 101B	~~300~~	
5.	Seam and Adhesion Properties, Field Seam Peel Adhesion (pounds/inch minimum)	ASTM D413	~~FTB~~	
6.	Environmental Resistance Properties			
	a. Low Temperature	ASTM D746	~~-70°~~	

Substitute for 40 mil specification

	b. Dimensional Stability (percent)	ASTM D1204 212 F, 15 min	±1
	c. Volatile Loss (percent)	ASTM D1203	0.1
	d. Resistance to Soil Burial (% change max. in original value)	ASTM 3083	
	1. Tensile Strength at Break		10
	2. Tensile Strength at Yield		10
	3. Elongation at Break		10
	4. Elongation at Yield		10
	5. Modulus of Elasticity		10
7.	Ozone Resistance	ASTM D1149 7 days, 100 pphm 104 F, bent loop	No Cracks
8.	Environmental Stress Cracks	ASTM D-1693 Condition C	1000 +

9. Carbon Black. The HDPE material shall contain not less than 2.0 percent carbon black as determined by ASTM D1603. No other compound ingredients shall be added to the HDPE resin.

10. Extrusion Resin. Resin used for extrusion joining of lining sheets and for repairs shall be HDPE produced from, and the same as, the sheet resin. Physical properties shall be the same as the lining sheets.

11. Metal Battons, straps, or bars shall be stainless steel, type 304 or better with prepunched slots.

12. Anchor Bolts. Anchor bolts shall be Hilti Kwik Bolt SS38-312 as shown on the Plans or approved equal. Nuts shall be copper-silicon alloy or age-hardened stainless steel. Age-hardened stainless steel shall conform to the requirements of ASTM standard A564-81, Type 630. Heat treatment shall be conducted at 900 degrees F. Washers shall be type 303 or 304 stainless steel.

13. Caulk. Caulk shall be neoprene Gacoflex N-1004 as manufactured by Gaco Western, Inc., Seattle, Washington, or of a type recommended by the manufacturer for use with its material. It shall be delivered in original sealed containers with the brand and name of the manufacturer clearly identified on each.

14. Sponge Rubber. Sponge rubber shall be neoprene, closed cell medium, type SC-42, 1/4 inch thick.

15. Rubber Adhesive. Adhesive shall be neoprene, Python No. 1062, contact type, or of a type recommended by the lining manufacturer.

16. Safety Rope. Safety rope shall be polyester rope, 3/4-inch diameter, with knots tied at 18 inches on center. Ropes shall be secured to 4" x 4" redwood posts located at top of slope as shown on the Plans. The rope shall extend from the post to the toe of the slope.

C. Composite liner shall be Geoseal or equivalent, composite non-woven polypropylene fabric laminated to an impermeable polyethylene membrane. Geoseal is manufactured by Phillips 66 and installed by The Gagle Company, Tulsa, Oklahoma. The typical properties of Geoseal are:

Thickness (ASTM D-751), mils 45

Weight (oz./sq. yd.) 13.1

Tensile Properties (ASTM D-751)
- Elongation at break (%) 46
- Breaking strength (lbs.) 210
- Modulus (100% elongation, lbs.) 370

Effect of low temperatures
(ASTM D-2136, 1/8" mandrel)
After 4 hours exposure at 60 F .... Pass

Effect of high temperatures (ASTM D-1204) on
dimensional stability
After 1 hour exposure at 212 F., % change .... -0.4

Soil burial (ASTM D-3083)
- Breaking strength (%) .... +5
- Elongation at break (%) .... -33
- Modulus at 100% elongation (%) .... +23

Fabric breaking strength (%) .... +5

Hydrostatic resistance (lbs./inch, minimum)	
ASTM D-751	350
Bonded seam strength (ASTM, D-751), lbs.	210
Peel adhesion (ASTM D-413), lbs./in	No Peel
Bonded seam strength	No change

2.02 MIXES

A. Clay shall be mixed with water to achieve the consistency recommended by the geotechnical engineer.

B. Adhesives for all fabricated membranes shall be mixed in strict accordance with the manufacturer's recommendations.

PART 3 - EXECUTION

3.01 INSPECTION

A. Pre-construction Inspection. The Contractor shall inspect the excavated basin prior to bidding. Any access problems, subgrade problems, any structures at pipe penetrations, or other problems that may interfere with or affect the performance of the liner system shall be addressed by the contractor and submitted for approval prior to installation.

B. Pre-Installation Inspection. The contractor, accompanied by a manufacturer's representative, shall inspect the pond with EMWD's inspector immediately prior to the placement of fabricated liner to ensure mitigation of all factors that may be detrimental to the lining system performance.

C. Post-Construction Inspection. The installation shall be inspected and certified by a Registered Engineer, to meet the requirements of the appropriate Regional Water Quality Control Board.

D. Liner Material

1. Clay shall be continuously inspected by a geotechnical engineer during placement.

2. Fabricated liners - in addition to visual checks, all seams shall be tested as follows:

a) Metal Probe Test. The Contractor shall run a metal probe along the length of all joints and repairs to ensure that the weld is continuous and absent of leak paths. Defects shall be marked and repaired.

b) Additional Testing. The Contractor shall further test all joints in one of the following methods. All testing shall be done in the presence of the District or his representative. All defective areas shall be repaired to the satisfaction of the District.

(i) Ultrasonic Test. The Contractor shall perform ultrasonic testing by passing a high frequency sound wave through the thickness of the joint.

If any voids, foreign objects, or obstructions are detected, an audible signal shall notify the operator, and the defective area shall be marked for repair.

(ii) Vacuum Test. The Contractor shall perform vacuum testing in the following manner. The area to be tested shall be cleaned of all dust, debris, dirt and other foreign matter. A soap solution shall be applied to the test area with a paint roller and the vacuum box immediately placed over the area of the lining to be tested. A vacuum of 8-10 inches of Mercury (Hg) shall be held as long as necessary for the inspector to record any leaks, as evidenced by bubbles in the soap solution.

E. Hydrostatic Test. A leakage test will be performed on the ponds after the lining system has been installed. The District will fill the reservoir to the high water level. Any leakage through the lining shall be noted over a five day test period as measured at least twice daily using a gauge mounted within the pond. Measurement will be taken by the District.

The District will account for evaporation losses as estimated from an evaporation pan (12 square foot surface area and 8 to 12 inches deep) or similar device. If leakage occurs, the pond shall be drained, inspected and repaired; and the pond shall then be refilled and retested. This process shall be repeated until leakage has been eliminated, with all test costs for the retesting borne by the Contractor.

3.02 PREPARATION

All rough grading will be completed and the inlet-outlet piping installed by others prior to bidding. The contractor shall inspect the site prior to bidding and shall be responsible for repair of erosion damage, fine grading, and subgrade preparation necessary prior to and during the lining process. All preparation work necessary for the furnishing and installation of an impermeable liner at the elevations and grades shown shall be the responsibility of the contractor.

A. Clay. All surfaces to be lined with clay shall have all points projecting above subgrade removed and the surface shall be rolled or otherwise compacted to 90% relative compaction prior to placement of clay.

B. High Density Polyethylene Liners shall have the surfaces prepared in accordance with the manufacturer's recommendations and according to the following. In the event of conflict, the most stringent requirements will govern:

1. Rolling and Compaction. Before final rolling and compaction, the earth subgrade shall be free from abrupt breaks, rocks, cobbles, boulders, debris and other foreign materials. Final rolling and compaction of the surface of earth subgrade shall be done with a vibrating roller or a steel wheel roller weighing not less than 200 pounds per linear inch of drum width. The surface shall be compacted to a minimum relative compaction of 90%. Areas not accessible to the roller shall be compacted by approved mechanical or hand tampers.

2. Completed Surface. The surface of the completed earth subgrade shall be smooth, uniform and free from sudden changes in grade. Minimum acceptable radius at corners shall be 25 feet.

3. Maintenance of the Completed Surface. The surface of earth subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the lining. Excessive cracking of the surface shall be repaired as directed by the District. The lining contractor shall be responsible for, and pay for, any necessary repairs to the earth subgrade required as a result of operations of lining installation.

C. Composite Liners shall have the surfaces prepared per manufacturer's recommendations and according to the following. In the event of a conflict, the most stringent requirements will govern. Erosion damage shall be repaired, and the subgrade shall be smooth and well compacted. It should be free of any angular rocks, stones over 2" in diameter, roots, and other foreign materials. All excess vegetation shall be removed.

3.03 INSTALLATION

A. Clay

1. Shall be installed on the bottom of the pond.

2. Geotechnical Engineers must supervise placement, water content, compaction and approve densities of placed clay.

3. Clay shall be a minimum of 12-inches thick.

4. Clay shall be densified to a minimum of 90 percent relative compaction per ASTM D-1557.

5. Additional clay shall be installed or stockpiled as recommended by the flexible lining contractor to enable construction of a watertight interface to the flexible lining.

B. <u>High Density Polyethylene Geomembrane</u>

1. Shall be installed on the slopes (sides) of the pond if Geoseal is not used.

2. The sheets shall be of lengths, widths, and placed to minimize field joining.

3. <u>Sand Bags</u>. Sand bags shall be used as required to hold the lining material in position during installation. Sand bags shall be sufficiently close-knit to preclude fines from working through the bottom, sides or seams of the bags. Paper bags, whether or not lined with plastic, will not be permitted. Burlap bags, if used, must be lined with plastic. Bags shall contain not less than 40 nor more than 60 pounds of sand, having 100 percent passing a number 8 screen and shall be tied closed after filling. Bags that are split, torn, or otherwise losing their contents shall be immediately removed from the work area and any spills immediately cleaned up.

4. <u>Field Joints</u>. Joints between the lining sheets shall be field welded using the manufacturer's recommended procedures and equipment. Field joints shall be made by overlapping adjacent sheets a minimum of four (4) inches.

5. <u>Repairs</u>. Any necessary repairs to the HDPE geomembrane shall be made with the same material as the lining, using the manufacturer's recommended procedures and equipment for field welding.

6. <u>Anchoring</u>. The liner shall be anchored in accordance with manufacturer's recommendations.

C. <u>Composite liner</u>. May be used in lieu of High Density Polyethylene Geomembrane on the pond slopes (sides).

1. <u>Material Layout and Anchors</u>. The panels shall be joined with the polyethylene side up and shall be anchored on a grid spacing not to exceed fifteen feet between anchor points. Unless otherwise stipulated, the outside edges of the panels shall be terminated along the top of the slope and placed in a peripheral trench no less than one foot deep and six inches wide. After placing the terminal end of the liner in a "J" configuration in the trench, it shall be secured by backfilling and compacting the excavated trench materials.

2. Field Joints. Seams shall be formed by matching the polyethylene surfaces and shall be stitched a minimum width of 1 inch from the outside edge, using polypropylene thread #207 or equivalent. The seam channel above the thread shall be cleared of all dirt and foreign material to ensure suitable bonding surface. The seams shall be made watertight by the application of extruded polyethylene.

   When it is not possible to make a sewn joint, a butt joint can be substituted. A butt joint consists of joining the edges of the material together by securing a backup strip of the liner material, polypropylene sides together, with hot adhesive and then sealing the gap with the extruded polyethylene.

3.04 FIELD QUALITY CONTROL

A. Clay. All excavation, placement, moisture control, and densification shall be supervised by a Geotechnical Engineer. The clay at the fabricated liner interface shall be restored in accordance with both the geotechnical engineer's and fabricated liner manufacturer's recommendations.

B. Fabricated Liners

   1. All joints and seals on completion of the Work shall be tightly bonded. Any lining surface showing injury due to scuffing or penetration by foreign objects or distresses shall be replaced or repaired as directed by the District.

   2. Visual Inspection. A visual inspection of the lining and joints shall be made by the Contractor as the installation progresses and again upon completion of the installation. Defective or questionable areas shall be clearly marked and repaired.

3.05 CLEAN-UP

Clean-up within the work area shall be an ongoing responsibility of the Contractor throughout the course of the Work. Particular care shall be taken to ensure that no trash, tools, and other unwanted materials are trapped beneath the lining. Care shall be taken to ensure that all scraps of lining material are removed from the work area prior to completion of the installation.

END OF SECTION 02598

SMOOTH HDPE GEOMEMBRANE
ENGLISH UNITS

Property	Test Method	Minimum Average Values				
		30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mils	ASTM D 5199					
minimum average		30	[illegible]	60	80	100
lowest individual reading		27	[illegible]	54	72	90
Sheet Density, g/cc	ASTM D 1505/D 792	0.940	[illegible]	0.940	0.940	0.940
Tensile Properties[1]	ASTM D 6693					
1. Yield Strength, lb/in		63	[illegible]	126	168	210
2. Break Strength, lb/in		114	[illegible]	228	304	380
3. Yield Elongation, %		12	[illegible]	12	12	12
4. Break Elongation, %		700	[illegible]	700	700	700
Tear Resistance, lb	ASTM D 1004	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	54	[illegible]	108	144	180
Stress Crack Resistance[2], hrs	ASTM D 5397 (App.)	300	[illegible]	300	300	300
Carbon Black Content[3], %	ASTM D 1603	2.0 - 3.0	[illegible]	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596			[illegible]		
Oxidative Induction Time (OIT) Standard OIT, minutes	ASTM D 3895	100	[illegible]	100	100	100
Oven Aging at 85°C Standard OIT - % retained after 90 days	ASTM D 5721 ASTM D 3895	55	[illegible]	55	55	55
UV Resistance[5] High Pressure OIT[6] - % retained after 1600 hrs	GRI GM11 ASTM D 5885	50	[illegible]	50	50	50
Seam Properties	ASTM D 6392 (@ 2 in/min)					
1. Shear Strength, lb/in		57	80	120	160	200
2. Peel Strength, lb/in - Hot Wedge		45	60	91	121	151
- Extrusion Fillet		39	52	78	104	130
Roll Dimensions						
1. Width (feet)		23	[illegible]	23	23	23
2. Length (feet)		1000	[illegible]	500	375	300
3. Area (square feet)		23,000	[illegible]	11,500	8,625	6,900
4. Gross weight (pounds, approx.)		3,470	[illegible]	3,470	3,470	3,470

1. Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gauge length of 1.3 inches; Break elongation is calculated using a gauge length of 2.0 inches.
2. The yield stress used to calculate the applied load for the SP-NCTL test should be the mean value via MQC testing.
3. Other methods such as ASTM D 4218 or microwave methods are acceptable if an appropriate correlation can be established.
4. Carbon black dispersion for 10 different views: Nine in Categories 1 and 2 with one allowed in Category 3.
5. The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
6. UV resistance is based on percent retained value regardless of the original HP-OIT value.

1993 Archaeological Investigations at Promised Land Plantation, New Providence Island, Bahamas

Prepared by:

Paul Farnsworth, Ph.D.

Assistant Professor of Anthropology,
Department of Geography and Anthropology
Louisiana State University
Baton Rouge, LA 70803 U.S.A

and

Laurie A. Wilkie, Ph.D.
Instructor of Anthropology
Department of Geography and Anthropology
Louisiana State University
Baton Rouge, LA 70803 U.S.A.

1995

EXCAVATION, ARTIFACT ANALYSIS, AND POTTERY PASTE CHARACTERISTICS AT THE PINK WALL SITE, NEW PROVIDENCE, BAHAMAS

A Thesis

Submitted to the Graduate Faculty of the
Louisiana Sate University and
Agricultural and Mechanical College
In partial fulfillment of the
Requirements for the degree of
Master of Arts

in

The Department of Geography and Anthropology

by
Kristine Bohon
B.A., University of Kansas, 1987
May 1999

EWART (BUTCH) MORGAN

MARINE DESIGN &CONSTRUCTION CONSULTING

3512 Guilford Road, Naples, Florida 34112 Phone (239) 825-5324

MEMORANDUM

Date: March 6, 2006

To: Todd Turrell

From: Butch Morgan

Ref: Heart Wood Piles & Non-CCA Framing

Todd, as per our conversation concerning marine construction materials and cost comparisons of CCA to Heartwood piles and ACQ treated framing materials. I do not recommend untreated wood piles to be installed in a submersed salt water environment. Heartwood type products are very durable and have a high resistance to fungi decay but very little resistance to marine borer worms. ACQ treated framing materials can adequately replace CCA but due to the corrosive qualities of the treatment all fasteners need to be stainless steel. The use of the non CCA treated lumber will substantially increase construction cost and decrease the longevity of a dock system. Other piling options such as Seapile composite pilings and composite framing are available but would almost triple the construction cost.

While I understand the concern of CCA treated products in decking, the use CCA products for support framing and submersible installation is widely accepted especially with a properly installed vinyl pile wrap.

Please contract me with any questions.

Ewart (Butch) Morgan

Butch Morgan

Marine Construction Consultant

UNIVERSAL BUILDING SPECIALTIES
210 Neptune Road
Auburndale, FL 33823
800-282-9583

Technology Transfer Fact Sheet

Center for Wood Anatomy Research

USDA Forest Service • Forest Products Laboratory • One Gifford Pinchot Drive • Madison, Wisconsin 53726-2398

Peltogyne spp.

Family: Leguminosae

Purpleheart

PURPLEHEART

Amaranth

Other Common Names: Palo morado (Mexico), Morado (Panama, Venezuela), Tananeo (Columbia), Koroboreli (Guyana), Purperhart (Surinam), Amarante (French Guiana), Pau roxo, Guarabu (Brazil), Violetwood (English trade).

Distribution: Center of distribution in the north-middle part of the Brazilian Amazon region; combined range of all species from Mexico through Central America and southward to southern Brazil.

The Tree: Trees grow to heights of 170 ft with diameters to 4 ft, but usually 1.5 to 3 ft; boles are straight, cylindrical, and clear 60 to 90 ft above buttresses up to 12 ft. high.

The Wood:

General Characteristics: Heartwood brown when freshly cut becoming deep purple upon exposure, eventually turning to a dark brown sharply demarcated from the off-white sapwood. Texture medium to fine; luster medium to high, variable; grain usually straight, sometimes wavy, roey, or irregular; without distinctive odor or taste.

Weight: Basic specific gravity (ovendry weight/green volume) varies with species from 0.67 to 0.91; air-dry density 50 to 66 pcf.

Mechanical Properties: (First set of data based on the 2-in. standard; second on the 2-cm standard; third on the 1-in. standard.)

Moisture content (%)	Bending strength (Psi)	Modulus of elasticity (1,000 psi)	Maximum crushing strength (Psi)
Green (75)	13,690	2,000	7,020
12%	19,220	2,270	10,320
Green (30)	21,000	2,560	9,250
15%	26,700	NA	12,200
12% (24)	30,900	3,460	14,500

Notice of Receipt of Requests to Cancel A Chromated Copper Arsenate (CCA) Use and to Amend Current Label Language

[Federal Register: September 8, 2004 (Volume 69, Number 173)]
[Notices]
[Page 54278-54280]
From the Federal Register Online via GPO Access [wais.access.gpo.g
[DOCID:fr08se04-45]

ENVIRONMENTAL PROTECTION AGENCY
[OPP-2004-0266; FRL-7674-7]

Notice of Receipt of Requests to Cancel A Chromated Copper Arsenate (CCA) Use and to Amend Current Label Language

AGENCY: Environmental Protection Agency (EPA).
ACTION: Notice.

SUMMARY: In accordance with section 6(f)(1) of the Federal Insecti Fungicide, and Rodenticide Act (FIFRA), as amended, EPA is issuin notice of receipt of requests from registrants of pesticide produc containing Chromated Copper Arsenate (CCA) to amend affected registrations to terminate the use ``members out of water and not subject to salt water [or brackish water] splash, and not in soil use,'' as currently stated under American Wood Preservers' Associa (AWPA) Standard C18 (Wood for Marine Construction)(For further information, please refer to the CCA guidance document at http:// www.epa.gov/pesticides/factsheets/chemicals/cca_awpa_june.pdf). Th requests for use termination proposed replacement label language reflecting the use terminations.

These registrants are requesting that these voluntary use terminations and associated label revisions become effective Decem 31, 2004. Each registrant waived the 180-day comment period (i.e., comment period in excess of 30 days).

DATES: Unless a request is withdrawn by October 8, 2004, the Agenc intends to issue cancellation orders granting these requests to am to terminate certain uses. The Agency will consider withdrawal re postmarked no later than October 8, 2004.

FOR FURTHER INFORMATION CONTACT: Rebecca Miller, Antimicrobials Division (7510C), Office of Pesticide Programs, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 204 0001; telephone number: (703) 305-0012; e-mail address: miller.rebecca@epa.gov.

SUPPLEMENTARY INFORMATION:

I. General Information

A. Does this Action Apply to Me?

This action is directed to the public in general. Although thi action may be of particular interest to persons who produce, sell, distribute or use pesticides, the Agency has not attempted to desc all the specific entities that may be affected by this action. If have any questions regarding the information in this notice, consu the person listed under FOR FURTHER INFORMATION CONTACT.

B. How Can I Get Copies of this Document and Other Related Informa

1. Docket. EPA has established an official public docket for t action under docket identification (ID) number OPP-2004-0266. The official public docket consists of the documents specifically referenced in this action, any public comments received, and other information related to this action. Although a part of the officia docket, the public docket does not include Confidential Business Information (CBI) or other information whose disclosure is restric by statute. The official public docket is the collection of materi that is available for public viewing at the Public Information anc Records Integrity Branch (PIRIB), Rm. 119, Crystal Mall #2, 1801 S. Bell Street, Arlington, VA. This docket facility is open f 8:30 a.m. to 4:00 p.m., Monday through Friday, excluding legal holidays. The docket telephone number is (703) 305-5805.

2. Electronic access. You may access this Federal Register doc electronically through the EPA Internet under the ``Federal Regist listings at http://www.epa.gov/fedrgstr/. An electronic version of public docket is available through EPA's electronic public docket comment system, EPA Dockets. You may use EPA Dockets at http:// www.epa.gov/edocket/ to submit or view public comments, access the index listing of the contents of the official public docket, and t access those documents in the public docket that are available electronically. Although not all docket materials may be available electronically, you may still access any of the publicly available docket materials through the docket facility identified in Unit I. Once in the system, select ``search,'' then key in the appropriate docket ID number.

II. What Action is the Agency Taking?

This notice announces receipt by the Agency of requests from registrants of pesticide products containing Chromated Copper Arse (CCA) to amend affected registrations to terminate the use ``membe out of water and not subject to salt water [or brackish water] splash,
and not in soil use,'' as currently stated under American Wood Preservers' Association (AWPA) Standard C18 (Wood for Marine Construction). The registrants requesting use termination have inc

proposed replacement label language reflecting the use terminatior The registrants made the requests by letters dated June 4, 2004 (Osmose, Inc.), June 10, 2004 (Arch Wood Protection, Inc.), and Ju 28, 2004 (CSI, Inc.). In the letters, each of the registrants wai the 180-day comment period (i.e., any comment period in excess of days). The label language proposed by the registrants is as follov

A. Revised Language Experimental Use Permit (EUP)

This product may only be used for preservative treatment of th following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the 2001 edition of the American Wood-Preservers' Association (AWPA) Standards: Lumber and Timber for Salt Water Use Only (C2), Piles (C3), Poles (C4), Plywood (C9), Wood for Highway Construction (C14 Round, Half Round and Quarter Round Fence Posts (C16), Poles, Pile and Posts Used as Structural Members on Farms, and Plywood Used or Farms (C16), Wood for Marine Construction (C18), Lumber and Plywoc for Permanent Wood Foundations(C22), Round Poles and Posts Used ir Building Construction (C23), Sawn Timber Used To Support Residenti and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34);

[[Page 54279]]

accordance with the respective cited standard (noted parenthetically) of the 2002 edition of the American Wood-Preservers' Association Standards: Lumber, Timbers and Plywood fo: Cooling Towers (C30). Forest products treated with this product mε only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred.

Effective December 31, 2004, this product may only be used fo: preservative treatment of the following categories of forest products and in accordance with the respective cited standard (not parenthetically) of the 2001 edition of the American Wood-Preservers' Association (AWPA) Standards: Lumber and Timber for Sε Water Use (also includes brackish water) Only (C2), Piles (C3), Poles (C4), Plywood(C9), Wood for Highway Construction (C14), Rour Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Fa: (C16), Wood for Marine Construction for Salt Water Use (also includes brackish water)(immersion and/or subject to saltwater (or brackish water) splash[``subject to saltwater (or brackish water) splash'' means any member of a marine structure which is positione above mean high tide, but is subject to frequent wetting from wave action], [Pilings (sheet, round and square), Timbers, and Plywood; Walers, Framing, Stringers and Cross Bracing (2"x8" and/or 3"x6" ε larger nominal dimensions and treated to a minimum of 0.60 pcf) (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction(C23), Sawn Timber Used To Support Residential and Commercial Structures(C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33) and Shakes and Shingles (C34); and in accordance with the respecti cited standard (noted parenthetically) of the 2002 edition of the American Wood-Preservers' Association Standards: Lumber, Timbers ε Plywood for cooling Towers (C30). Forest products treated with thi product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred, except whe otherwise provided above.

B. Revised Language Manufacturing Use Product (MUP)

This product may only be used (1) for formulation of the following end-use wood preservative products: ammoniacal copper zi arsenate(ACZA) or chromated copper arsenate (CCA) labeled in accordance with the Directions for Use shown below, or (2) by persons other than the registrant, in combination with one or more other products to make: ACZA wood preservative; or CCA wood preservative that is used in accordance with the Directions for Us shown below.

This product may only be used for preservative treatment of th following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the 2001 edition of the American Wood-Preservers' Association (AWPA) Standards: Lumber and Timber for Salt Water Use Only (C2), Piles (C3), Poles (C4), Plywood(C9), Wood for Highway Construction (C14) Round, Half Round and Quarter Round Fence Posts (C16), Poles, Pile and Posts Used as Structural Members on Farms, and Plywood Used or Farms (C16), Wood for Marine Construction (C18), Lumber and Plywoc for Permanent Wood Foundations(C22), Round Poles and Posts Used ir Building Construction (C23), Sawn Timber Used To Support Residenti and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34); and in accordance with the respective cited standard(noted parenthetically) of the 2002 edition of the American Wood-Preservers' Association Standards: Lumber, Timbers and Plywood fo: Cooling Towers (C30). Forest products treated with this product ma only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred.

Effective December 31, 2004, this product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (not parenthetically) of the 2001 edition of the American Wood-Preservers' Association (AWPA) Standards: Lumber and Timber for Sa Water Use (also includes brackish water) Only (C2), Piles (C3), Poles (C4), Plywood(C9), Wood for Highway Construction (C14), Rour Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Fa: (C16), Wood for Marine Construction for Salt Water Use (also includes brackish water)(immersion and/or subject to saltwater (or brackish water) splash[``subject to saltwater (or brackish water) splash'' means any member of a marine structure which is positione above mean high tide, but is subject to frequent wetting from wave action], [Pilings (sheet, round and square), Timbers, and Plywood; Walers, Framing, Stringers and Cross Bracing (2"x8" and/or 3"x6" a larger nominal dimensions and treated to a minimum of 0.60 pcf) (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction(C23), Sawn Timber Used To Support Residential and Commercial Structures(C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33) and Shakes and Shingles (C34); and in accordance with the respecti cited standard (noted parenthetically) of the 2002 edition of the American Wood-Preservers' Association Standards: Lumber, Timbers a Plywood for Cooling Towers (C30). Forest products treated with thi product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred, except whe otherwise provided above.

Unless a request is withdrawn by the registrant within 30 days publication of this notice, the Agency intends to issue cancellati orders granting these requests and ordering the registration amenc and label revisions. Users of these pesticides or anyone else desi the retention of the affected use or having any comment on the prc label language should contact the applicable registrant directly c this 30-day period.

Table 1 includes the names and addresses of record for all registrants, by EPA company number, requesting voluntary terminati certain uses of products listed in Table 2:

Table 1.--Registrants Requesting Voluntary Termination of Certair Listed in Table 2

EPA Company No.	Company name and adc
062190	Arch Wood Protection, 1955 Lake Park Drive, 250, Smyrna, GA 30080
010465	Chemical Specialties, One Woodlawn Green, Charlotte, NC 28217
003008	Osmose Inc., 980 Ellicott Street Buffalo, NY 14209-239E

Table 2.--Registrations With Requests for Amendments to Termir Certain Uses

Registration Number	Product Name
End Use Products	
003008-17	K-33-C (72%) Wood Preservative
003008-21	Special K-33 Preservat
003008-34	K-33 (60%) Wood Preser
003008-35	K-33 (40%) Type-B Wooc Preservative
003008-36	K-33-C (50%) Wood Preservative
003008-42	K-33-A (50%) Wood Preservative
003008-72	Osmose Arsenic Acid 7:
010465-26	CCA Type-C Wood Preser 50%

010465-28	CCA Type-C Wood Preser 60%

[[Page 54280]]

010465-32	CSI Arsenic Acid 75%
035896-2	Wood-Last Conc. Wood Preservation AQ 50% Solution CCA-Type A
062190-2	Wolmanac Concentrate 5
062190-8	Wolmanac Concentrate 7
062190-14	Wolmanac Concentrate 6
Manufacturing Use Products	
003008-66	Arsenic Acid 75%
010465-32	CSI Arsenic Acid 75%
062190-7	Arsenic Acid 75%

III. What is the Agency's Authority for Taking this Action?

Section 6(f)(1) of FIFRA provides that a registrant of a pesti product may at any time request that any of its pesticide registra be canceled or amended to terminate use. FIFRA further provides th before acting on the request, EPA must publish a notice of receipt any such request in the Federal Register and provide a comment per Thereafter, the Administrator may approve such a request.

IV. Procedures for Withdrawal of Request

Registrants who choose to withdraw a request for voluntary cancellation or amendment to terminate uses must submit such withc in writing to the person listed under FOR FURTHER INFORMATION CONT postmarked before October 8, 2004. This written withdrawal of the request for cancellation or amendment to terminate uses will apply to the applicable FIFRA section 6(f)(1) request listed in this not If the product(s) have been subject to a previous cancellation or termination action, the effective date of cancellation and all oth provisions of any earlier cancellation order or use termination ar controlling. The withdrawal request must also include a commitment pay any reregistration fees due, and to fulfill any applicable unsatisfied data requirements.

V. Provisions for Disposition of Existing Stocks

Existing stocks are those stocks of registered pesticide produ which are currently in the United States and which have been packa labeled, and released for shipment prior to the effective date of cancellation action. Unless the provisions of an earlier order app existing stocks already in the hands of dealers or users can be distributed, sold, or used legally until they are exhausted, provi that such further sale and use comply with the EPA-approved label labeling of the affected product. Exception to this general approa will be made in specific cases when more stringent restrictions or sale, distribution, or use of the products or their ingredients ha already been imposed, as in a Special Review action, or where the Agency has identified significant potential risk concerns associat with a particular chemical.

The registrants making these requests asked for no existing st provisions. Should these requests be granted, on or after December 2004, any sale, distribution, or use of existing stocks by the registrants of the subject registrations would be prohibited. This refers to CCA product labels that bear the proposed-to-be deleted Marine Use, ``members out of water and not subject to saltwater [c brackish water]
splash and not in soil use.'' Sale, distribution or use of the stocks in the channels of trade by persons other than the registrant may continue until depleted, provided any sale, distrib or use is in accordance with the existing label of that product.

List of Subjects

Environmental Protection, Chromated Copper Arsenate, Treated W Pesticides and Pests.

Dated: August 27, 2004.
Frank Sanders,
Director, Antimicrobials Division, Office of Pesticide Programs.
[FR Doc. 04-20336 Filed 9-7-04; 8:45 am]
BILLING CODE 6560-50-S

Final June 16, 2004
(February 1, 2002)

Supplemental Guidance on Interpretation of Revised Chromated Copper Arsenate (CCA) Wood Preservative Label

Introduction

The registrations and EPA-approved labels for CCA wood preservatives were voluntarily amended by each registrant to state that, effective December 31, 2003, CCA may be lawfully used only to treat wood or forest products for uses that fall under the 2001 Edition of the American Wood Preservers' Association (AWPA) standards listed on the new label. Subsequently, in December of 2003 and February of 2004, the registrants requested that their registrations and EPA-approved labels be amended to include standard C30 (Lumber, Timbers and Plywood for Cooling Towers-Preservative Treatment by Pressure Processes) of the 2002 Edition of the AWPA standards. These amendments were approved by the Agency and the resulting label language is described below.

To address confusion in the marketplace resulting from the first round of label changes, the registrants agreed to limit wood treated for marine construction (C18 standard) to brackish or saltwater use (immersion), and members out of water but subject to saltwater (or brackish water) splash. To accomplish this, the registrants have requested voluntary deletion of the use under C18 which refers to "members out of water and not subject to salt water splash and not in soil use," along with the necessary label changes, effective December 31, 2004. The Agency will publish a 6(f) notice under FIFRA and then take appropriate steps to finalize the changes. In the interim, the registrants have agreed to label new product with the revised label language (for both end-use products and manufacturing-use products) to clarify allowable uses. This language is described on page 7-9.

This guidance is designed to help explain the revised labeling to wood treaters, building code inspectors, and others responsible for working with CCA and CCA-treated wood. It is of utmost importance that the wood or forest products 1) be treated according to the AWPA standards listed on the new label, and 2) that these treated wood or forest products be used according to the AWPA standard listed on the new label.

Exporting/Importing of CCA-Treated Wood

With respect to the exporting of CCA-treated wood, the following text from the Federal Register of April 9, 2003 (68 FR 17370) needs to be consulted: "...wood treatment facilities are only allowed to treat wood products with CCA that are intended to be used only for those remaining uses approved on the CCA product label. Wood intended for use in prohibited residential settings may not be treated with CCA after December 30, 2003, unless the product being used is a pre-existing product and such use is permitted by that product label. (See Unit V: "Provisions for Disposition of Existing Stocks") Because of the method of product manufacture and distribution used in the wood preservation industry, the Agency does not expect any more than de minimus stocks to exist as of December 31, 2003, that do not bear the more restrictive label language. Hence, beginning December 31, 2003, unless the label on the affected product provides otherwise, it would be illegal to treat wood with CCA for any prohibited residential use, regardless of whether the treated wood is to be used in the United States or exported for use in other countries."

With respect to the importing of CCA-treated wood, CCA-treated wood for which pesticidal claims are being made must be registered as a pesticide if it does not qualify for the treated article exemption. In order to qualify for the treated article exemption, the treated wood must be treated with a pesticide product registered in the United States for the treatment of wood for the specific intended use in question.

Current Label

Following is the new label amendment language, as cited in the Federal Register: April 9, 2003 (68 FR 17371-72). Additional language was specified and is shown below in the respective sections to accomplish the label change for standard C30 (Lumber, Timbers and Plywood for Cooling Towers-Preservative Treatment by Pressure Processes), which was included in the 2002 Edition of the American Wood Preservers' Association (AWPA) standards, and the pending change for C18 (Wood for Marine Construction). The additional language is described below.

The following manufacturing product registrations were amended to delete certain terminated uses as of May 16, 2003:

3008-66	Arsenic Acid 75%
10465-32	CSI Arsenic Acid 75%
62190-7	Arsenic Acid 75%

For the above identified manufacturing-use products, the accepted amended labeling reads as follows:

Effective December 31, 2003, this product may only be used (1) for formulation of the following end-use wood preservative products: ammoniacal copper zinc arsenate (ACZA) or chromated copper arsenate (CCA) labeled in accordance with the Directions for Use shown below, or (2) by persons other than the registrant, in combination with one or more other products to make: ACZA wood preservative; or CCA wood preservative that is used in accordance with the Directions for Use shown below. Effective December 31, 2003, this product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the 2001 edition of the American Wood-Preservers Association Standards: Lumber and Timber for Salt Water Use Only (C2), Piles (C3), Poles (C4), Plywood (C9), Wood for Highway Construction (C14), Round, Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Farms (C16), Wood for Marine Construction (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction (C23), Sawn Timber Used To Support Residential and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34). Forest products treated with this product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred.

The following end use product registrations were amended to delete certain terminated uses as of May 16, 2003:

3008-17	K-33-C (72%) Wood Preservative
3008-21	Special K-33 Preservative
3008-34	K-33 (60%) Wood Preservative
3008-35	K-33 (40%) Type-B Wood Preservative
3008-36	K-33-C (50%) Wood Preservative
3008-42	K-33-A (50%) Wood Preservative
3008-72	Osmose Arsenic Acid 75%
10465-26	CCA Type-C Wood Preservative 50%
10465-28	CCA Type-C Wood Preservative 60%

10465-32	CSI Arsenic Acid 75%
35896-2	Wood-Last Conc. Wood Preservation AQ 50% Solution CCA-Type A
62190-2	Wolmanac Concentrate 50%
62190-8	Wolmanac Concentrate 72%
62190-14	Wolmanac Concentrate 60%

For the above identified end-use products, the accepted amended label is to read as follows:

Effective December 31, 2003, this product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the 2001 edition of the American Wood-Preservers Association Standards: Lumber and Timber for Salt Water Use Only (C2), Piles (C3), Poles (C4), Plywood (C9), Wood for Highway Construction (C14), Round, Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Farms (C16), Wood for Marine Construction (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction (C23), Sawn Timber Used To Support Residential and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34). Forest products treated with this product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred. *

*The referenced FR notice also included provision for registrants to make certain additional specified changes to their labels via notification.

The above label for CCA refers to the 2001 Edition of the AWPA standards to specify the categories of wood products that may be treated as of December 31, 2003. As noted above, subsequent changes were made to these labels, which, among other things, added a reference to the 2002 Edition of the AWPA standards for C30 only. That language as well as language pertaining to

C18 follows.

<u>New Label Language for C30</u>

Following is the new label amendment language which references the AWPA Standard C30 (label revisions were approved as of December 2003 and February 2004):

(For end-use products [EUP]): "...this product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the ...2002 edition of the American Wood-Preservers Association Standard: Lumber and Plywood for Cooling Towers (C30)..."

(For manufacturing-use products [MUP]): The accepted amended labeling reads as follows:

"Effective December 31, 2003, this product may only be used (1) for formulation of the following end-use wood preservative products: ammoniacal copper zinc arsenate (ACZA) or chromated copper arsenate (CCA) labeled in accordance with the Directions for Use shown below, or (2) by persons other than the registrant, in combination with one or more other products to make: ACZA wood preservative; or CCA wood preservative that is used in accordance with the Directions for Use shown below. Effective December 31, 2003, this product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the ...2002 edition of the American Wood-Preservers Association Standard: Lumbers and Plywood for Cooling Towers (C30)..."

<u>Revised Label Language for C18</u>

For the termination of the use ("members out of water and not subject to saltwater [or brackish water] splash[1] and not in soil use") under AWPA standard C18 (Wood for Marine Construction) the registrants have agreed to label new product with the revised label language (for both end-use products and manufacturing-use products) to clarify allowable uses (see page 1). The following language has been approved by the Agency for the expression of uses allowable under the AWPA C18 Wood for Marine Construction Standard and reflects the label language that incorporates that change as well as those described earlier:

REVISED LANGUAGE (EUP)

This product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the 2001 edition of the American Wood-Preservers' Association (AWPA) Standards: Lumber and Timber for Salt Water Use Only (C2), Piles (C3), Poles (C4), Plywood (C9), Wood for Highway Construction (C14), Round, Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Farms (C16), Wood for Marine Construction (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction (C23), Sawn Timber Used To Support Residential and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34); and in accordance with the respective cited standard (noted parenthetically) of the 2002 edition of the American Wood-Preservers' Association Standards: Lumber, Timbers and Plywood for Cooling Towers (C30). Forest products treated with this product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred.

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[1]See Definitions Page for definition of "subject to saltwater (or brackish water) splash."

Effective December 31, 2004, this product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the 2001 edition of the American Wood-Preservers' Association (AWPA) Standards: Lumber and Timber for Salt Water Use (also includes brackish water) Only (C2), Piles (C3), Poles (C4), Plywood (C9), Wood for Highway Construction (C14), Round, Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Farms (C16), Wood for Marine Construction for Salt Water Use (also includes brackish water) (immersion and/or subject to saltwater (or brackish water) splash ["subject to saltwater (or brackish water) splash" means any member of a marine structure which is positioned above mean high tide, but is subject to frequent wetting from wave action]), [Pilings (sheet, round and square), Timbers, and Plywood; Walers, Framing, Stringers and Cross Bracing (2" x 8" and/or 3"x6" and larger nominal dimensions and treated to a minimum of 0.60 pcf) (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction (C23), Sawn Timber Used To Support Residential and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34); and in accordance with the respective cited standard (noted parenthetically) of the 2002 edition of the American Wood-Preservers' Association Standards: Lumber, Timbers and Plywood for Cooling Towers (C30). Forest products treated with this product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred, except where otherwise provided above.

REVISED LANGUAGE (MUP)

This product may only be used (1) for formulation of the following end-use wood preservative products: ammoniacal copper zinc arsenate (ACZA) or chromated copper arsenate (CCA) labeled in accordance with the Directions for Use shown below, or (2) by persons other than the registrant, in combination with one or more other products to make: ACZA wood preservative; or CCA wood preservative that is used in accordance with the Directions for Use shown below.

This product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the 2001 edition of the American Wood-Preservers' Association (AWPA) Standards: Lumber and Timber for Salt Water Use Only (C2), Piles (C3), Poles (C4), Plywood (C9), Wood for Highway Construction (C14), Round, Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Farms (C16), Wood for Marine Construction (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction (C23), Sawn Timber Used To Support Residential and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34); and in accordance with the respective cited standard (noted parenthetically) of the 2002 edition of the American Wood-Preservers' Association Standards: Lumber, Timbers and Plywood for Cooling Towers (C30). Forest products treated with this product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred.

Effective December 31, 2004, this product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the 2001 edition of the American Wood-Preservers' Association (AWPA) Standards: Lumber and Timber for Salt Water Use (also includes brackish water) Only (C2), Piles (C3), Poles (C4), Plywood (C9), Wood for Highway Construction (C14), Round, Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Farms (C16), Wood for Marine Construction for Salt Water Use (also includes brackish water) (immersion and/or subject to saltwater (or brackish water) splash ["subject to saltwater (or brackish water) splash" means any member of a marine structure which is positioned above mean high tide, but is subject to frequent wetting from wave action]), [Pilings (sheet, round and square), Timbers, and Plywood; Walers, Framing, Stringers and Cross Bracing (2" x 8" and/or 3"x6" and larger nominal dimensions and treated to a minimum of 0.60 pcf) (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction (C23), Sawn Timber Used To Support Residential and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34); and in accordance with the respective cited standard (noted parenthetically) of the 2002 edition of the American Wood-Preservers' Association Standards: Lumber, Timbers and Plywood for Cooling Towers (C30). Forest products treated with this product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred, except where otherwise provided above.

Building code inspectors, wood treaters, and other responsible for working with CCA and CCA-treated wood need to review the label, along with the 2001 and 2002* editions of the AWPA standards, to determine whether CCA can be used to treat the wood for a particular application. If the use category of wood to be treated is not included within the AWPA standards listed on the label, CCA is not registered for that treatment, and CCA may not be used for such treatment.

The new label does not allow the use of CCA for virtually all wood use at residences, including wood used in playground structures, decks, picnic tables, landscaping timbers, residential fencing, patios and walkways/boardwalks. The label authorizes use of CCA in industrial and commercial applications specified therein. Most of those applications are heavy retention treatments of 0.50 or more pounds per cubic foot. The only standards under which lower retention treatments may be used are C9, C14, C16, C18 (fish ladders, lobster traps and oyster farming timbers only), C25, C28, C30*, C33 and C34. Most dimensional lumber (defined as lumber that is from 2" up to, but not including, 5" thick, and that is 2 or more inches in width) historically treated with CCA to .25 or .40 under AWPA standard C2 may no longer be treated with CCA and must now be treated with alternative non-CCA preservatives.

* 2002 Edition is to be consulted for C30 only.

Examples of CCA Uses

The following list is taken from the 2001 Edition of the AWPA standards and, for C30 only, the 2002 Edition of the AWPA standards to illustrate examples of the types of wood that fall within each standard. While the list is not exhaustive, it does provide some examples of specific wood/forest product uses within each AWPA commodity standards referenced on the label and that may be treated with CCA.

Lumber and Timber for Salt Water Use Only (2001 AWPA Standard C2)

- Aquaculture timber, in salt water and subject to marine borer attack
- Boat Building material
  - Lumber, timbers, plywood, in salt water and subject to marine borer attack
- Bulkhead Sheathing
  - In salt water and subject to marine borer attack
- Mariculture lumbers and timbers
  - In brackish or saltwater use and subject to marine borer attack
- Marine lumber and timbers
  - In brackish or saltwater use and subject to marine borer attack
- Oyster farming timbers
- Lobster Traps
- Fish Ladders
- Highway Material

Structural lumber and timbers in salt water use and subject to marine borer attack

Piles (2001 AWPA Standard C3)

- Highway Material
  - Piles, foundation, land and fresh water use
  - Piling in salt water use and subject to marine borer attack
- Piles
  - Foundation (round)
  - Land and fresh water use (round)
  - Marine (round) in salt or brackish and subject to marine borer attack
  - Marine, dual treatment (round)

Poles (2001 AWPA Standard C4)

- Agriculture, Wood used on farms
  - Round poles
  - As round structural members
- Highway material
  - Poles, lighting
- Poles, agriculture
  - Round
- Poles, building
  - Round
  - Poles, utility
  - Distribution
  - Transmission

Plywood (2001 AWPA Standard C9)

- Agriculture, Wood used on farms
  - Plywood, not in soil contact
  - Plywood, in soil contact
- Boat building material

- Plywood, fresh water
- Lumber, timbers, plywood, in salt water and subject to marine borer attack

Building construction material

- Roof decking, plywood

Decking, Tongue and Groove

- Flooring, plywood
- Subflooring, plywood

Decking

- Roof, plywood

Plywood

- Sub-floor, damp, above ground
- Exterior, above ground
- Soil contact

Wood for Highway Construction (2001 AWPA Standard C14)

Beams and timbers, glue laminated before or after treatment

- For highway construction

Decking

- Highway bridge

Highway material

- Lumber and timber for bridges, structural members, decking, cribbing, and culverts
- Structural lumber and timbers in salt water use and subject to marine borer attack
- Piles, foundation, land and fresh water use
- Piling in salt water use and subject to marine borer attack
- Posts: Round, half-round, quarter round
- Posts: Sawn
- Poles, lighting

Glue laminated beams

Brine Storage buildings

Posts, guardrail

- Round
- Sawn

Posts, sawn four sides
    Highway
    Other

Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Farms (2001 AWPA Standard C16)

Agriculture, Wood used on farms
    Round poles and posts as round structural members
    Sawn poles and posts
    As structural members
    Plywood, not in soil contact
    Plywood, in soil contact
Sawn building poles and posts
    As structural members
Round building poles and posts
    As structural members
Sawn structural timbers (piles)
    Supporting residential and commercial structures
Poles, Agricultural
    Round; includes farm-fence rails
    Sawn
Posts, fence
    Round, half-round, and quarter round

Wood for Marine Construction (2001 AWPA Standard C18)
Except Members Out of Water and Not Subject to Splash and Not in Soil Use ***(effective 12/31/04)***

Timber and plywood in salt water use
Aquaculture timber, in salt water and subject to marine borer attack
Mariculture lumber and timbers
    In brackish or saltwater use and subject to marine borer attack
Marine lumber and timbers
    In brackish or saltwater use and subject to marine borer attack

- Oyster farming timbers
- Lobster Traps
- Fish Ladders
- Piles
- Members Out of Water But Subject to Saltwater (or brackish water) Splash
- Marine (round) in salt or brackish and subject to marine borer attack
- Marine, dual treatment (round)

Lumber and Plywood for Permanent Wood Foundations (2001 AWPA Standard C22)

- Lumber and Plywood for Wood Foundations

Round Poles and Posts Used in Building Construction (2001 AWPA Standard C23)

- Round building poles and posts
  - As structural members
- Poles, building
  - Round

Sawn Timber Used to Support Residential and Commercial Structures (2001 AWPA Standard C24)

- Sawn structural timbers
  - Supporting residential and commercial structures
- Piles
  - Sawn timber piles

Sawn Crossarms (2001 AWPA Standard C25)

- Crossarms, sawn

Structural Glued-Laminated Members and Laminations before Gluing (2001 AWPA Standard C28)[2] (nails/mechanical fasteners may be used as laminate in lieu of, or in combination with, glue)

- Beams and timbers, glue laminated before or after treatment
  - Damp environment, above ground
  - Dry environment, above ground
  - Ground contact
- Highway material
  - Glue laminated beams

Lumber, Timbers and Plywood for Cooling Towers-Preservative Treatment by Pressure Processes (2002 AWPA Standard C30)

- Lumber, timber and plywood for Cooling Tower Use Only

Structural Composite Lumber (2001 AWPA Standard C33)

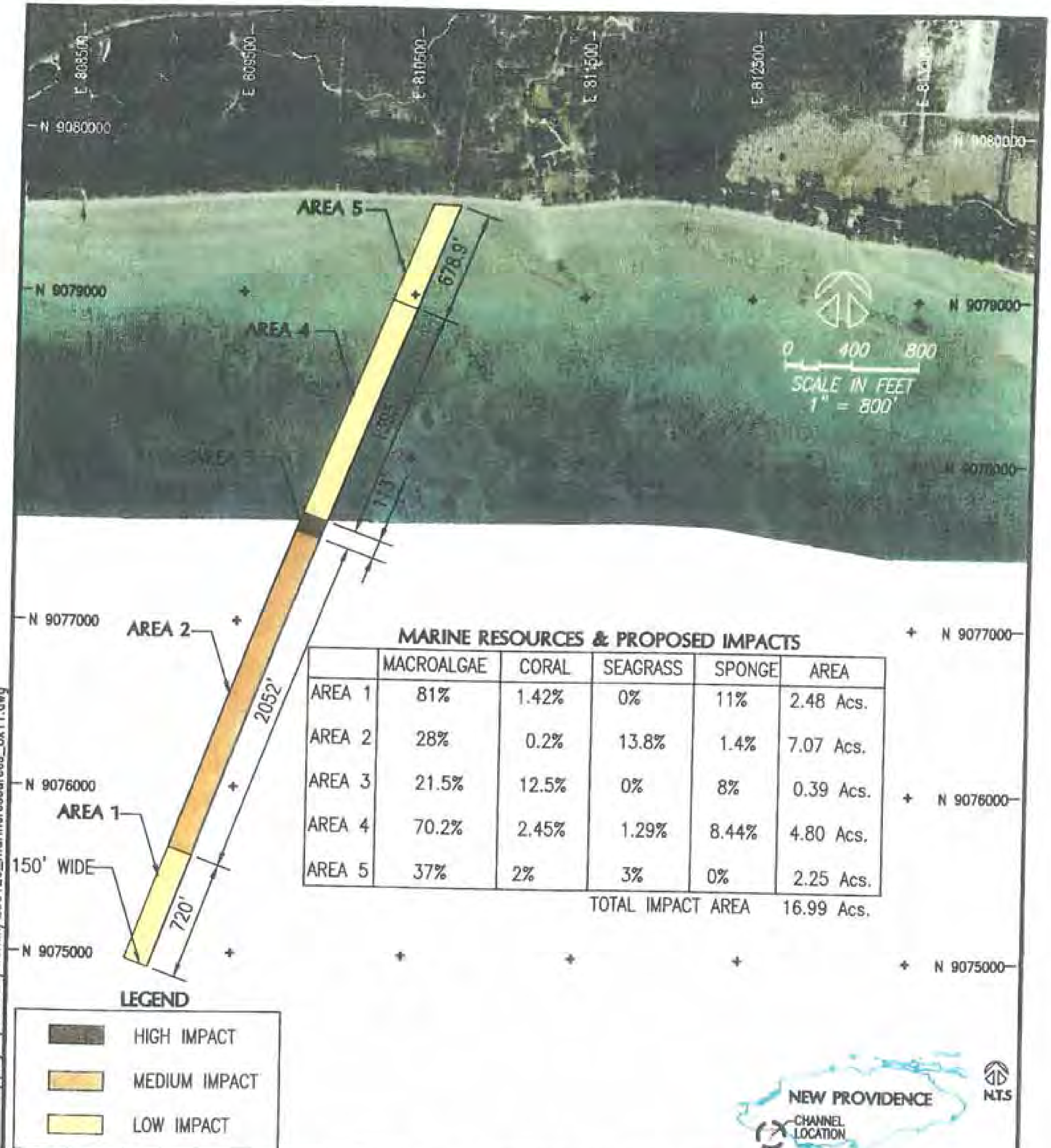
- Highway material
  - Structural composite lumber
- Lumber, structural composite
  - Above ground
  - Soil or fresh water contact
  - Highway construction

Shakes and Shingles (2001 AWPA Standard C34)

- Shakes and Shingles
- Siding, commercial, residential, agricultural

- Tile Batts

[2] The Agency interprets this to include nailed laminated members (nails/mechanical fasteners may be used as laminate in lieu of, or in combination with, glue).



MARINE RESOURCES & PROPOSED IMPACTS

	MACROALGAE	CORAL	SEAGRASS	SPONGE	AREA
AREA 1	81%	1.42%	0%	11%	2.48 Acs.
AREA 2	28%	0.2%	13.8%	1.4%	7.07 Acs.
AREA 3	21.5%	12.5%	0%	8%	0.39 Acs.
AREA 4	70.2%	2.45%	1.29%	8.44%	4.80 Acs.
AREA 5	37%	2%	3%	0%	2.25 Acs.
				TOTAL IMPACT AREA	16.99 Acs.

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T.K. BLANKENSHIP
FL.REG.55910

PARK RIDGE SECURITIES CORPORATION
NASSAU
BAHAMAS

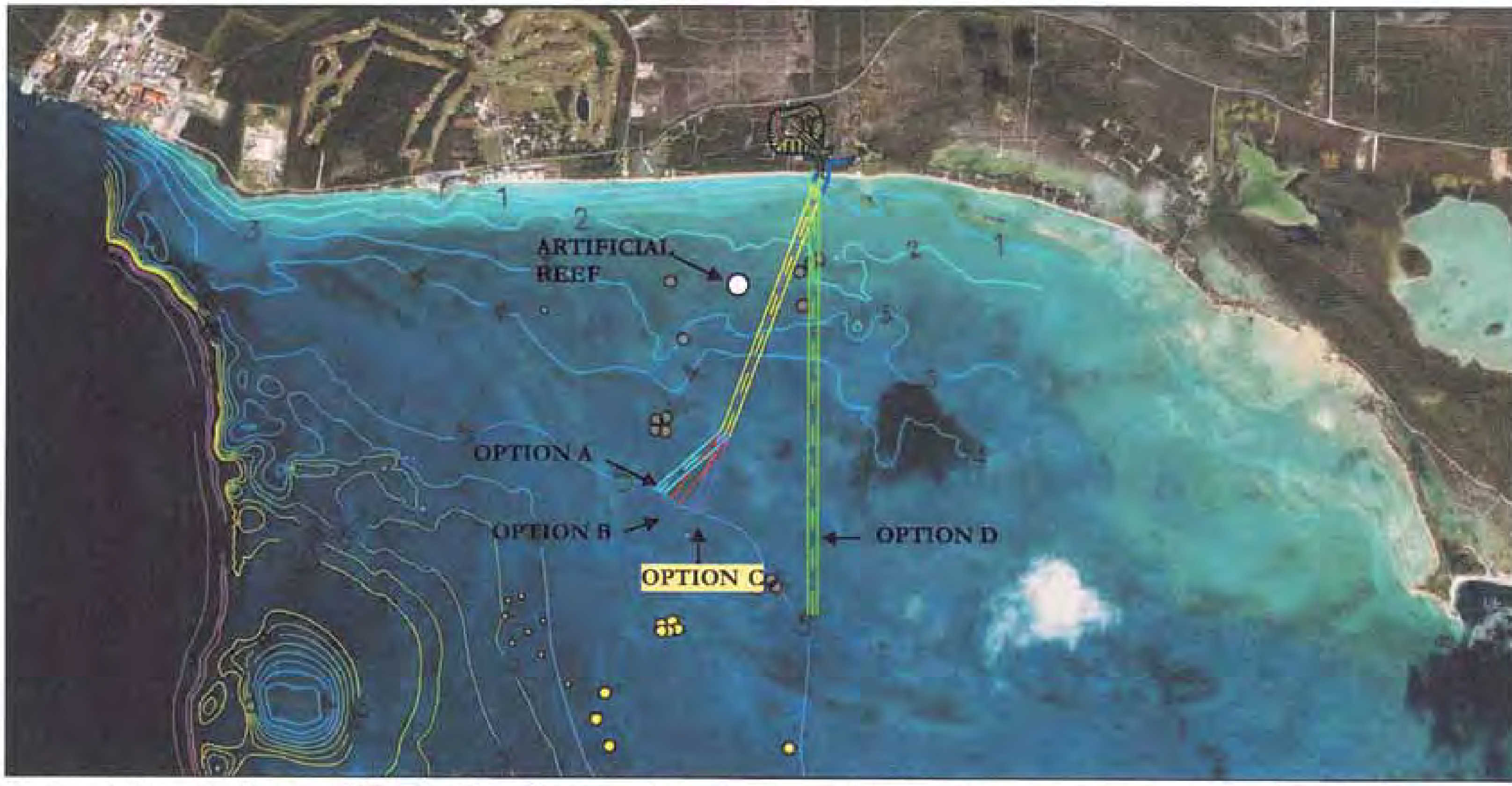
COASTAL SYSTEMS INTERNATIONAL

COASTAL SYSTEMS INTERNATIONAL, INC.
464 South Dixie Highway, Coral Gables, Florida 33146
Tel: 305/661-3655 Fax: 305/661-1914 www.CoastalSystemsIntl.com
STATE OF FLORIDA EB #7087
Coastal, Environmental, Civil Engineering and Management

ALBANY PROJECT
MARINA ENTRANCE CHANNEL

MARINE RESOURCES SURVEY

JOB:	233120	DATE:	01/11/06
BY:	SR	SHEET 1 OF 1	

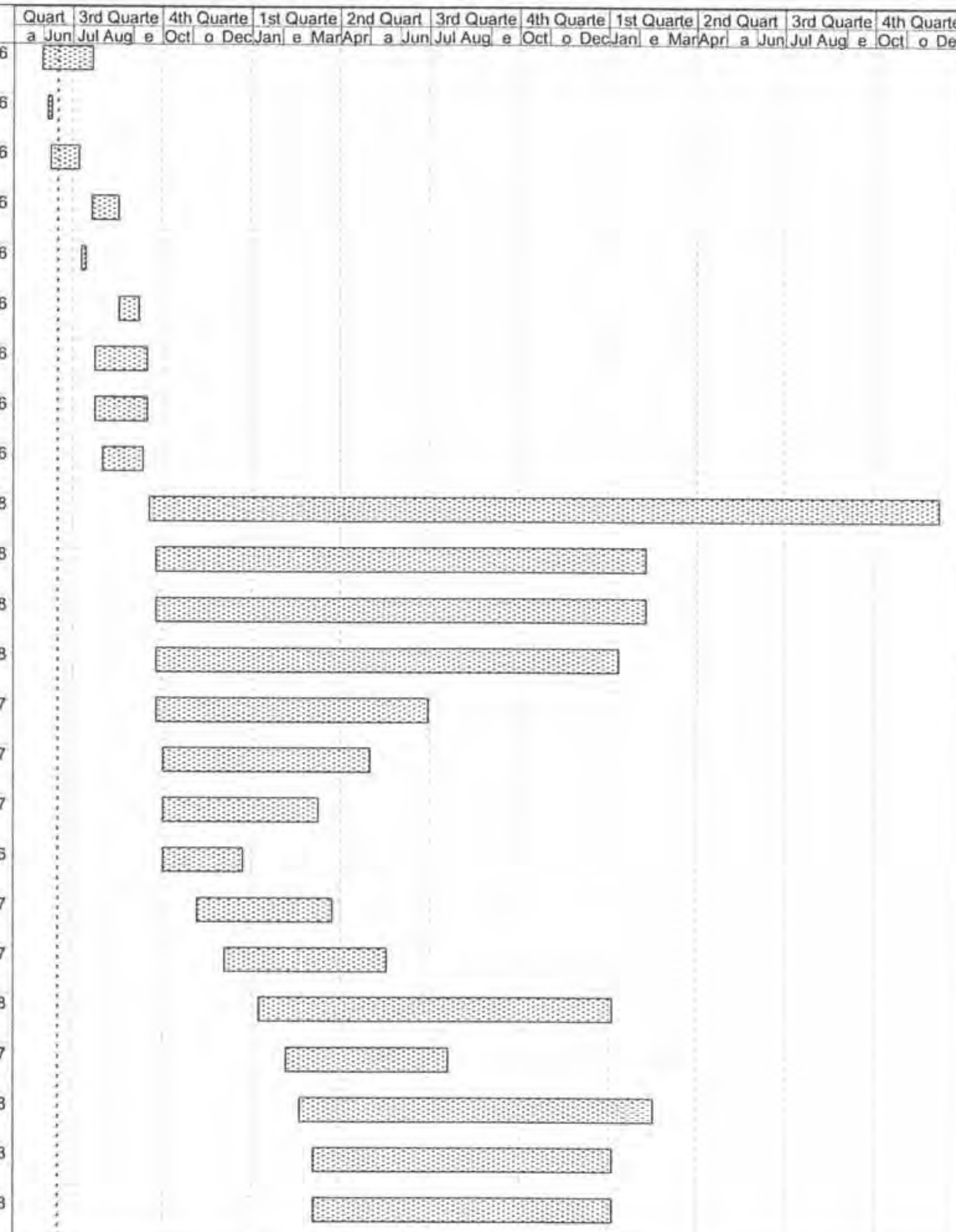


S

Preferred channel alignment (Option C) and proposed location for reef balls or limestone boulders to create artificial reef.

Figure 6.3 Major Dive Sites in the immediate area

ID		Task Name	Duration	Start	Finish
10		Submittal for Subdivision Approval in Principle	38 days	Wed 5/31/06	Fri 7/21/06
14		Submit R.A.I. #6 to B.E.S.T.	4 days	Tue 6/6/06	Fri 6/9/06
9		Environmental Approvals	21 days	Fri 6/9/06	Fri 7/7/06
11		MOW review of roads and drainage design	20 days	Fri 7/21/06	Thu 8/17/06
8		Heads Of Agreement Signed	5 days	Mon 7/10/06	Fri 7/14/06
12		Water and Sewer Corp Approval	15 days	Fri 8/18/06	Thu 9/7/06
18		B.E.C. Review	40 days	Mon 7/24/06	Fri 9/15/06
19		Batelco Review	40 days	Mon 7/24/06	Fri 9/15/06
15		Bonding	30 days	Tue 8/1/06	Mon 9/11/06
1		Cottage Construction	580 days	Mon 9/18/06	Fri 12/5/08
2		Marina Construction	360 days	Mon 9/25/06	Fri 2/8/08
3		Golf Course Construction	360 days	Mon 9/25/06	Fri 2/8/08
13		Infrastructure Construction (phase one)	340 days	Mon 9/25/06	Fri 1/11/08
24		Reroute South West Bay Road	200 days	Mon 9/25/06	Fri 6/29/07
16		Construct Golf Course Maintenance Building	152 days	Mon 10/2/06	Tue 5/1/07
17		Construct R.O. Plant	115 days	Mon 10/2/06	Fri 3/9/07
20		Construct Power Sub-station/interconnect	60 days	Mon 10/2/06	Fri 12/22/06
23		Construct Sewer System/interconnect	100 days	Mon 11/6/06	Fri 3/23/07
22		Construct Water Distribution System/interconnect	120 days	Mon 12/4/06	Fri 5/18/07
4		Renovations to Albany House	260 days	Mon 1/8/07	Fri 1/4/08
21		Construct Power Distribution system/interconnect	120 days	Mon 2/5/07	Fri 7/20/07
7		Water park Construction	260 days	Mon 2/19/07	Fri 2/15/08
5		Golf Clubhouse construction	220 days	Mon 3/5/07	Fri 1/4/08
6		Fitness Center Construction	220 days	Mon 3/5/07	Fri 1/4/08



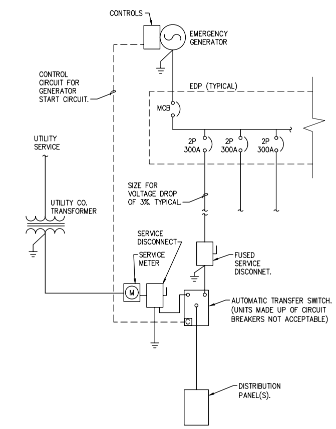
Project: Albany060606.mpp
Date: Thu 6/15/06

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

LOAD CALCULATION: UNIT PANELS EDP

MULTI-FAMILY DWELLING		VOLTS: –	PHASE: –	
NUMBER OF UNITS: –		BUILDING: –		
LOAD DESCRIPTION	PER UNIT	QUANTITY OF UNITS	LOAD PER UNIT	WATTS
GENERAL LIGHTING UNIT (SQ. FT.)	4000 SF	1	3 WATTS/SQ. FT.	12,000
SMALL APPLIANCE (QUANTITY)	2.0	1	1,500 WATTS EACH	3,000
DISPOSAL (QUANTITY)	1.0	1	1,200 WATTS EACH	1,200
DISHWASHER (QUANTITY)	1.0	1	1,200 WATTS EACH	1,200
LAUNDRY (QUANTITY)	1.0	1	1,500 WATTS EACH	1,500
WASHER/DRYER (QUANTITY)	1.0	1	5,000 WATTS EACH	5,000
RANGE (COOKTOP) (QUANTITY)	1.0	1	4,500 WATTS EACH	4,500
MICROWAVE (QUANTITY)	1.0	1	1,300 WATTS EACH	1,300
EXHAUST FAN (QUANTITY)	2.0	1	100 WATTS EACH	200
PADDLE FANS (QUANTITY)	3.0	1	150 WATTS EACH	300
WATER HEATER (QUANTITY)	1.0	1	4,800 WATTS EACH	4,800
SPA/WHIRLPOOL (QUANTITY)	1.0	1	1,500 WATTS EACH	1,500
MISC.				
TOTAL			WATTS	36,500
FIRST 10,000 WATTS AT 100%	10,000	1	WATTS X 100%	10,000
REMAINDER AT 40%	26,500	1	WATTS X 40%	10,600
AHU FAN	–	–	WATTS X 100%	–
COMP/COND OR HEAT PUMP	2	1	8,000 WATTS X 100%	16,000
HEAT STRIP	–	–	WATTS X 65%	–
TOTAL			WATTS	36,600
SERVICE SIZE			AMPS	153 A

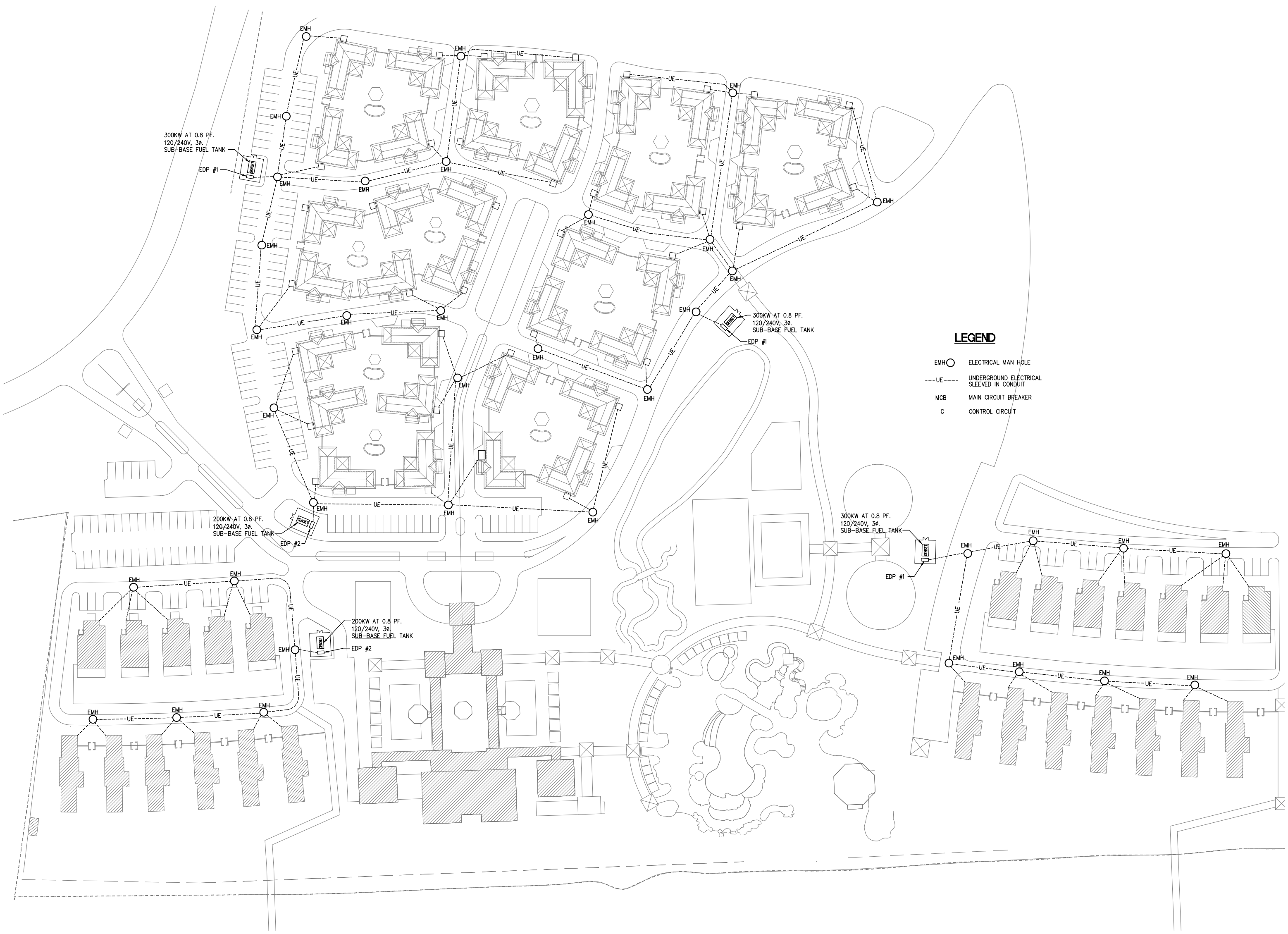
WINTERLOAD USED FOR LOAD CALCULATION.



TYPICAL RESIDENTIAL SERVICE ONE-LINE SCHEMATIC
SCALE: NO SCALE

LEGEND

EMH ○	ELECTRICAL MAN HOLE
--- UE ---	UNDERGROUND ELECTRICAL SLEEVED IN CONDUIT
MCB	MAIN CIRCUIT BREAKER
C	CONTROL CIRCUIT



ELECTRICAL SITE PLAN
SCALE: 1" = 50'-0"

REVISIONS	DATE

PENINSULA ENGINEERING INC.
2016 ALDEN ROAD
ORLANDO, FLORIDA 32803
EB 3089
VOICE 407.246.1688
FAX 407.246.1664
http://www.peifla.com
E-Mail to: pei@peifla.com

David A. Burger, PE,
FL Reg. No. 47146

These documents are conceptual and are being submitted in order to receive Building Department review, comment, and interpretations, and are not completed construction documents.

ELECTRICAL SITE PLAN

Albany Bahamas Cottages

DRAWN	DAB
CHECKED	DAB
DATE	T.B.D.
SCALE	AS NOTED
JOB NO.	06242
SHEET	E1
PAGE OF SHEETS	

Document Last Edited: May 30, 2006 - 4:35pm Document Plotted By: dsterling PEI Document File Name: S:\Proj2006\06242\06242elec\06242E1.dwg

Model: **250REOZDD**

KOHLER. POWER SYSTEMS

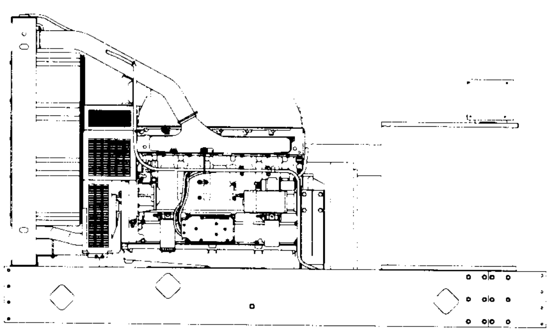
208-600 V

Diesel

ISO 9001
KOHLER POWER SYSTEMS
NATIONALLY REGISTERED

Ratings Range

		60 Hz
Standby:	**kW**	250-265
	kVA	313-331
Prime:	**kW**	225-240
	kVA	281-300



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set complies with ISO 8528-5 requirements for transient performance.
- The generator set accepts rated load in one step.
- The 60 Hz generator set engine is certified by the Environmental Protection Agency (EPA) to conform to Tier 3 nonroad emissions regulations.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
  - Kohler's Fast-Response™ III wound field (WF) design alternator provides excellent voltage response and short-circuit capability using an auxiliary power brushless exciter.
  - Kohler's unique Fast-Response™ II excitation system delivers excellent voltage response and short circuit capability using a permanent magnet (PM)-excited alternator.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - Controllers are available for all applications. See controller features inside.
  - The low coolant level shutdown prevents overheating (standard on radiator models only).
  - Integral vibration isolation eliminates the need for under-unit vibration spring isolators.
  - An electronic, isochronous governor delivers precise frequency regulation.
  - Electronic engine controls and a generator set microprocessor controller combine to deliver one of the most advanced control systems in today's market.

Generator Set Ratings

				130°C Rise Standby Rating		105°C Rise Prime Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
	120/208	3	60	260/325	902	235/294	815
	120/240	3	60	260/325	782	235/294	707
	127/220	3	60	260/325	853	235/294	771
4UA10W/	139/240	3	60	265/331	797	240/300	722
4UA10	220/380	3	60	250/313	475	225/281	427
	240/416	3	60	260/325	451	235/294	408
	277/480	3	60	265/331	398	240/300	361
	347/600	3	60	260/325	313	235/294	283
	120/208	3	60	265/331	919	240/300	833
	120/240	3	60	265/331	797	240/300	722
	127/220	3	60	265/331	869	240/300	787
4UA13W/	139/240	3	60	265/331	797	240/300	722
4UA13	220/380	3	60	265/331	503	240/300	456
	240/416	3	60	265/331	460	240/300	416
	277/480	3	60	265/331	398	240/300	361
	347/600	3	60	265/331	319	240/300	289

RATINGS: All three-phase units are rated at 0.8 power factor. *Standby Ratings:* Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. *Prime Power Ratings:* Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIB-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. GENERAL GUIDELINES FOR DERATION: *Altitude:* Derate 0.5% per 305 m (1000 ft.) elevation above 183 m (600 ft.) up to a maximum elevation of 3660 m (12000 ft.). *Temperature:* Derate 1.0% per 5.5°C (10°F) temperature above 40°C (104°F). For radiator cooling system capacity, derate 1.4°C (2.5°F) per 305 m (1000 ft.) elevation above 183 m (600 ft.).

Alternator Specifications

Specifications	Alternator
Manufacturer	Kohler
Type	4-Pole, Rotating Field
Exciter type	
Wound field (WF)	Wound Exciter Field with Separate Excitation Power Winding
Permanent magnet (PM)	Brushless, Permanent-Magnet
Leads: quantity, type	12, Reconnectable
Voltage regulator	Solid State, Volts/Hz
Insulation:	NEMA MG1
Material	Class H
Temperature rise	130°C, Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Voltage regulation, no-load to full-load	
Wound field (WF) alternator	±0.25% Average
Permanent magnet (PM) alternator	±2% Average
550 controller (with 0.5% drift due to temperature variation)	3-Phase Sensing, ±0.25%
One-step load acceptance	100% of Rating
Unbalanced load capability	100% of Rated Standby Current
Peak motor starting kVA:	(35% dip for voltages below)
480 V 4UA10W/4UA10	790
480 V 4UA13W/4UA13	980

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Vacuum-impregnated windings with fungus-resistant epoxy varnish for dependability and long life.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Fast-Response™ III wound field (WF) brushless alternator with auxiliary power brushless exciter for excellent load response.
- Fast-Response™ II brushless alternator with brushless exciter for excellent load response.

Application Data

Engine

Engine Specifications	60 Hz
Manufacturer	Detroit Diesel
Engine: model, type	S60, 4-Cycle Turbocharged, Aftercooled
Cylinder arrangement	6, Inline
Displacement, L (cu. in.)	14.0 (855)
Bore and stroke, mm (in.)	133 x 168 (5.24 x 6.61)
Compression ratio	16.0:1
Piston speed, m/min. (ft./min.)	604 (1980)
Main bearings: quantity, type	7, Precision Half-Shell
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	310 (415)
Cylinder head material	Cast Iron
Piston: type, material	Crosshead, Malleable Iron
Crankshaft material	Forged Steel
Valve material:	
Intake	Iron-Based Seat
Exhaust	Nickel-Based Seat
Governor: type, make/model	DDEC Electronic Control
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System	60 Hz
Exhaust flow at rated kW, m^3/min. (cfm)	70.9 (2505)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	444 (831)
Maximum allowable back pressure, kPa (in. Hg)	10.2 (3.0)
Engine exhaust outlet size, mm (in.)	See ADV Drawing

Engine Electrical

Engine Electrical System	60 Hz
Battery charging alternator:	
Ground (negative/positive)	Negative
Volts (DC)	24
Ampere rating	40
Starter motor rated voltage (DC)	24
Battery, recommended cold cranking amps (CCA):	
Qty., CCA rating each	Two, 950
Battery voltage (DC)	12

Fuel

Fuel System	60 Hz
Fuel supply line, min. ID, mm (in.)	13 (0.50)
Fuel return line, min. ID, mm (in.)	8 (0.31)
Max. lift, engine-driven fuel pump, m (ft.)	2.1 (6.8)
Max. fuel flow, Lph (gph)	329 (86.8)
Fuel prime pump	N/A
Fuel filter: quantity, type	2, Primary/Secondary
Recommended fuel	#2 Diesel

Lubrication

Lubricating System	60 Hz
Type	Full Pressure
Oil pan capacity, L (qt.)	30 (32)
Oil pan capacity with filter, L (qt.)	36 (38)
Oil filter: quantity, type	2, Cartridge
Oil cooler	Water-Cooled

Application Data

Cooling

Radiator System	60 Hz
Ambient temperature, °C (°F)	50 (122)
Engine jacket water capacity, L (gal.)	22.7 (6.0)
Radiator system capacity, including engine, L (gal.)	45.4 (12)
Engine jacket water flow, Lpm (gpm)	363 (96)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	115 (6530)
Heat rejected to air charge cooler at rated kW, dry exhaust, kW (Btu/min.)	75.9 (4315)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	965 (38)
Fan, kWm (HP)	22 (30)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)

Operation Requirements

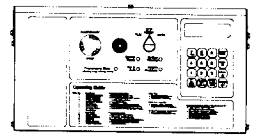
Air Requirements	60 Hz
Radiator-cooled cooling air, m^3/min. (scfm)*	561 (19800)
Combustion air, m^3/min. (cfm)	29 (1035)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	44.5 (2533)
Alternator, kW (Btu/min.)	24.6 (1399)

* Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

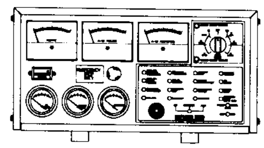
Diesel, Lph (gph) at % load	Standby Rating
100%	79.9 (21.1)
75%	64.4 (17.0)
50%	43.5 (11.5)
25%	24.2 (6.4)

Diesel, Lph (gph) at % load	Prime Rating
100%	71.9 (19.0)
75%	56.0 (14.8)
50%	37.9 (10.0)
25%	22.0 (5.8)

Controllers



Decision-Maker™ 550 Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Programmable microprocessor logic and digital display features.
Alternator safeguard circuit protection.
12- or 24-volt engine electrical system capability.
Remote start, remote annunciation, and remote communication options.
Refer to G6-46 for additional controller features and accessories.



Decision-Maker™ 3+, 16-Light Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Microprocessor logic, AC meters, and engine gauge features.
12- or 24-volt engine electrical system capability.
Remote start, prime power, and remote annunciation options.
Refer to G6-30 for additional controller features and accessories.

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-565-3381, Fax 920-459-1646
For the nearest sales and service outlet in the US and Canada, phone 1-800-544-2444
KohlerPowerSystems.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Standard Features and Accessories

Standard Features

- Alternator Protection (standard with 550 controller)
- Battery Rack and Cables
- Electronic, Isochronous Governor
- Oil Drain Extension

Accessories

Enclosed Unit

- ❑ Weather Housing

Open Unit

- ❑ Exhaust Silencer, Hospital (kit: PA-354905)
- ❑ Exhaust Silencer, Critical (kit: PA-354880)
- ❑ Flexible Exhaust Connector, Stainless Steel

Cooling System

- ❑ Block Heater
- ❑ Radiator Duct Flange

Fuel System

- ❑ Flexible Fuel Lines
- ❑ Fuel Pressure Gauge
- ❑ Fuel/Water Separator with Prime Feature
- ❑ Hand Primer Pump
- ❑ Subbase Fuel Tanks
- ❑ Subbase Fuel Tank with Day Tank

Electrical System

- ❑ Battery
- ❑ Battery Charger, Equalize/Float Type
- ❑ Battery Heater

Engine and Alternator

- ❑ Alternator, Wound Field (WF)
- ❑ Alternator, Permanent Magnet (PM)
- ❑ Air Cleaner, Heavy Duty
- ❑ Air Cleaner Restriction Indicator
- ❑ Alternator Strip Heater
- ❑ Bus Bar Kits
- ❑ Crankcase Emission Canister
- ❑ CSA Certification
- ❑ Line Circuit Breaker (NEMA1 enclosure)
- ❑ Line Circuit Breaker with Shunt Trip (NEMA1 enclosure)
- ❑ Rated Power Factor Testing
- ❑ Rodent Guards
- ❑ Safeguard Breaker (not available with 550 controller)
- ❑ Skid End Caps
- ❑ Voltage Regulation, 1%
- ❑ Voltage Regulator Sensing, Three-Phase

Paralleling System

- ❑ Voltage Regulator Relocation Kit

Maintenance and Literature

- ❑ General Maintenance Literature Kit
- ❑ Maintenance Kit (includes air, oil, and fuel filters)
- ❑ NFPA 110 Literature
- ❑ Overhaul Literature Kit
- ❑ Production Literature Kit

Controller

- ❑ Common Failure Relay Kit
- ❑ Communications Products and PC Software (550 controller only)
- ❑ Customer Connection Kit
- ❑ Dry Contact Kit (isolated alarm)
- ❑ Engine Prealarm Sender Kit
- ❑ Remote Annunciator Panel
- ❑ Remote Audiovisual Alarm Panel
- ❑ Remote Emergency Stop Kit
- ❑ Remote Mounting Cable
- ❑ Run Relay Kit

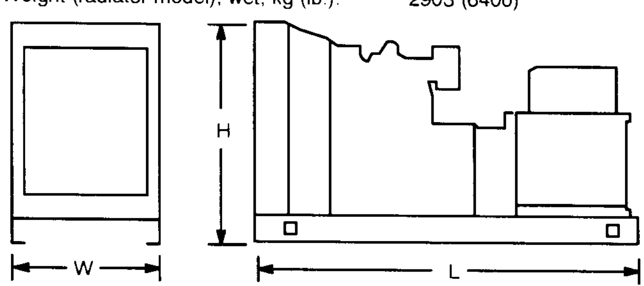
Miscellaneous Accessories

- ❑ ______________________
- ❑ ______________________
- ❑ ______________________
- ❑ ______________________
- ❑ ______________________
- ❑ ______________________

Dimensions and Weights

Overall Size, L x W x H, mm (in.): 3500 x 1250 x 1941 (137.8 x 49.2 x 76.4)

Weight (radiator model), wet, kg (lb.): 2903 (6400)



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

DISTRIBUTED BY:

G5-277 (250REOZDD) 9/05a

Model: 300REOZDD

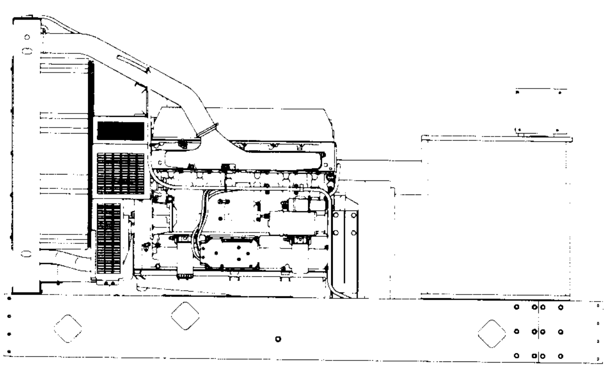
KOHLER. POWER SYSTEMS

208-600 V **Diesel**

ISO 9001
KOHLER POWER SYSTEMS
NATIONALLY REGISTERED

Ratings Range

		60 Hz
Standby:	kW	280-300
	kVA	350-375
Prime:	kW	255-270
	kVA	319-338



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set complies with ISO 8528-5 requirements for transient performance.
- The generator set accepts rated load in one step.
- The 60 Hz generator set engine is certified by the Environmental Protection Agency (EPA) to conform to Tier 3 nonroad emissions regulations.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
  - Kohler's Fast-Response™ III wound field (WF) design alternator provides excellent voltage response and short-circuit capability using an auxiliary power brushless exciter.
  - Kohler's unique Fast-Response™ II excitation system delivers excellent voltage response and short circuit capability using a permanent magnet (PM)-excited alternator.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - Controllers are available for all applications. See controller features inside.
  - The low coolant level shutdown prevents overheating (standard on radiator models only).
  - Integral vibration isolation eliminates the need for under-unit vibration spring isolators.
  - An electronic, isochronous governor delivers precise frequency regulation.
  - Electronic engine controls and a generator set microprocessor controller combine to deliver one of the most advanced control systems in today's market.

Generator Set Ratings

				130°C Rise Standby Rating		105°C Rise Prime Rating	
Alternator	Voltage	Ph	Hz	kW/kVA	Amps	kW/kVA	Amps
4UA13W/ 4UA13	120/208	3	60	300/375	1041	270/338	937
	120/240	3	60	300/375	902	270/338	812
	127/220	3	60	300/375	984	270/338	886
	139/240	3	60	300/375	902	270/338	812
	220/380	3	60	280/350	532	255/319	484
	240/416	3	60	300/375	520	270/338	468
	277/480	3	60	300/375	451	270/338	406
	347/600	3	60	300/375	361	270/338	325

RATINGS: All three-phase units are rated at 0.8 power factor. *Standby Ratings:* Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. *Prime Power Ratings:* Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIB-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. GENERAL GUIDELINES FOR DERATION: *Altitude:* Derate 0.5% per 305 m (1000 ft.) elevation above 1525 m (5000 ft.) up to a maximum elevation of 3660 m (12000 ft.). *Temperature:* Derate 1.0% per 5.5°C (10°F) temperature above 40°C (104°F). For radiator cooling system capacity, derate 1.4°C (2.5°F) per 305 m (1000 ft.) elevation above 183 m (600 ft.).

Alternator Specifications

Specifications	Alternator
Manufacturer	Kohler
Type	4-Pole, Rotating Field
Wound field (WF)	Wound Exciter Field with Separate Excitation Power Winding
Permanent magnet (PM)	Brushless, Permanent-Magnet
Leads: quantity, type	12, Reconnectable
Voltage regulator	Solid State, Volts/Hz
Insulation:	NEMA MG1
Material	Class H
Temperature rise	130°C, Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Voltage regulation, no-load to full-load	
Wound field (WF) alternator	±0.25% Average
Permanent magnet (PM) alternator	±2% Average
550 controller (with 0.5% drift due to temperature variation)	3-Phase Sensing, ±0.25%
One-step load acceptance	100% of Rating
Unbalanced load capability	100% of Rated Standby Current
Peak motor starting kVA:	(35% dip for voltages below)
480 V 4UA13W/4UA13	980

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Vacuum-impregnated windings with fungus-resistant epoxy varnish for dependability and long life.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Fast-Response™ III wound field (WF) brushless alternator with auxiliary power brushless exciter for excellent load response.
- Fast-Response™ II brushless alternator with brushless exciter for excellent load response.

Application Data

Engine

Engine Specifications	60 Hz	
Manufacturer	Detroit Diesel	
Engine: model, type	S60, 4-Cycle Turbocharged, Aftercooled	
Cylinder arrangement	6, Inline	
Displacement, L (cu. in.)	14.0 (855)	
Bore and stroke, mm (in.)	133 x 168 (5.24 x 6.61)	
Compression ratio	16.0:1	
Piston speed, m/min. (ft./min.)	604 (1980)	
Main bearings: quantity, type	7, Precision Half-Shell	
Rated rpm	1800	
Max. power at rated rpm, kWm (BHP)	366 (490)	321 (430)
Cylinder head material	Cast Iron	
Piston: type, material	Crosshead, Malleable Iron	
Crankshaft material	Forged Steel	
Valve material:		
Intake	Iron-Based Seat	
Exhaust	Nickel-Based Seat	
Governor: type, make/model	DDEC Electronic Control	
Frequency regulation, no-load to full-load	Isochronous	
Frequency regulation, steady state	±0.25%	
Frequency	Fixed	
Air cleaner type, all models	Dry	

Exhaust

Exhaust System	60 Hz
Exhaust flow at rated kW, m^3/min. (cfm)	81.9 (2895)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	507 (944)
Maximum allowable back pressure, kPa (in. Hg)	10.2 (3.0)
Engine exhaust outlet size, mm (in.)	See ADV Drawing

Engine Electrical

Engine Electrical System	60 Hz
Battery charging alternator:	
Ground (negative/positive)	Negative
Volts (DC)	24
Ampere rating	40
Starter motor rated voltage (DC)	24
Battery, recommended cold cranking amps (CCA):	
Qty., CCA rating each	Two, 950
Battery voltage (DC)	12

Fuel

Fuel System	60 Hz
Fuel supply line, min. ID, mm (in.)	13 (0.50)
Fuel return line, min. ID, mm (in.)	8 (0.31)
Max. lift, engine-driven fuel pump, m (ft.)	2.1 (6.8)
Max. fuel flow, Lph (gph)	329 (86.8)
Fuel prime pump	N/A
Fuel filter: quantity, type	2, Primary/Secondary
Recommended fuel	#2 Diesel

Lubrication

Lubricating System	60 Hz
Type	Full Pressure
Oil pan capacity, L (qt.)	30 (32)
Oil pan capacity with filter, L (qt.)	36 (38)
Oil filter: quantity, type	2, Cartridge
Oil cooler	Water-Cooled

Application Data

Cooling

Radiator System	60 Hz
Ambient temperature, °C (°F) *	50 (122)
Engine jacket water capacity, L (gal.)	22.7 (6.0)
Radiator system capacity, including engine, L (gal.)	45.4 (12)
Engine jacket water flow, Lpm (gpm)	363 (96)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	140 (7945)
Heat rejected to air charge cooler at rated kW, dry exhaust, kW (Btu/min.)	90.7 (5160)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	965 (38)
Fan, kWm (HP)	22 (30)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)

* Weather housing reduces ambient temperature capability by 5°C (9°F).

Operation Requirements

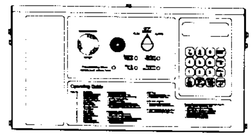
Air Requirements	60 Hz
Radiator-cooled cooling air, m^3/min. (scfm)÷	561 (19800)
Combustion air, m^3/min. (cfm)	31 (1105)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	51.8 (2949)
Alternator, kW (Btu/min.)	24.3 (1382)

÷ Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

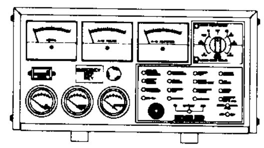
Diesel, Lph (gph) at % load	Standby Rating
100%	96.1 (25.4)
75%	76.5 (20.2)
50%	51.9 (13.7)
25%	27.6 (7.3)

Diesel, Lph (gph) at % load	Prime Rating
100%	85.9 (22.7)
75%	65.5 (17.3)
50%	43.9 (11.6)
25%	24.6 (6.5)

Controllers



Decision-Maker™ 550 Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Programmable microprocessor logic and digital display features.
Alternator safeguard circuit protection.
12- or 24-volt engine electrical system capability.
Remote start, remote annunciation, and remote communication options.
Refer to G6-46 for additional controller features and accessories.



Decision-Maker™ 3+, 16-Light Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Microprocessor logic, AC meters, and engine gauge features.
12- or 24-volt engine electrical system capability.
Remote start, prime power, and remote annunciation options.
Refer to G6-30 for additional controller features and accessories.

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-565-3381, Fax 920-459-1646
For the nearest sales and service outlet in the US and Canada, phone 1-800-544-2444
KohlerPowerSystems.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Standard Features and Accessories

Standard Features

- Alternator Protection (standard with 550 controller)
- Battery Rack and Cables
- Electronic, Isochronous Governor
- Oil Drain Extension

Accessories

Enclosed Unit

- ❑ Weather Housing

Open Unit

- ❑ Exhaust Silencer, Hospital (kit: PA-354905)
- ❑ Exhaust Silencer, Critical (kit: PA-354880)
- ❑ Flexible Exhaust Connector, Stainless Steel

Cooling System

- ❑ Block Heater
- ❑ Radiator Duct Flange

Fuel System

- ❑ Flexible Fuel Lines
- ❑ Fuel Pressure Gauge
- ❑ Fuel/Water Separator with Prime Feature
- ❑ Hand Primer Pump
- ❑ Subbase Fuel Tanks
- ❑ Subbase Fuel Tank with Day Tank

Electrical System

- ❑ Battery
- ❑ Battery Charger, Equalize/Float Type
- ❑ Battery Heater

Engine and Alternator

- ❑ Alternator, Wound Field (WF)
- ❑ Alternator, Permanent Magnet (PM)
- ❑ Air Cleaner. Heavy Duty
- ❑ Air Cleaner Restriction Indicator
- ❑ Alternator Strip Heater
- ❑ Bus Bar Kits
- ❑ Crankcase Emission Canister
- ❑ CSA Certification
- ❑ Line Circuit Breaker (NEMA1 enclosure)
- ❑ Line Circuit Breaker with Shunt Trip (NEMA1 enclosure)
- ❑ Rated Power Factor Testing
- ❑ Rodent Guards
- ❑ Safeguard Breaker (not available with 550 controller)
- ❑ Skid End Caps
- ❑ Voltage Regulation, 1%
- ❑ Voltage Regulator Sensing, Three-Phase

Paralleling System

- ❑ Voltage Regulator Relocation Kit

Maintenance and Literature

- ❑ General Maintenance Literature Kit
- ❑ Maintenance Kit (includes air, oil, and fuel filters)
- ❑ NFPA 110 Literature
- ❑ Overhaul Literature Kit
- ❑ Production Literature Kit

Controller

- ❑ Common Failure Relay Kit
- ❑ Communications Products and PC Software (550 controller only)
- ❑ Customer Connection Kit
- ❑ Dry Contact Kit (isolated alarm)
- ❑ Engine Prealarm Sender Kit
- ❑ Remote Annunciator Panel
- ❑ Remote Audiovisual Alarm Panel
- ❑ Remote Emergency Stop Kit
- ❑ Remote Mounting Cable
- ❑ Run Relay Kit

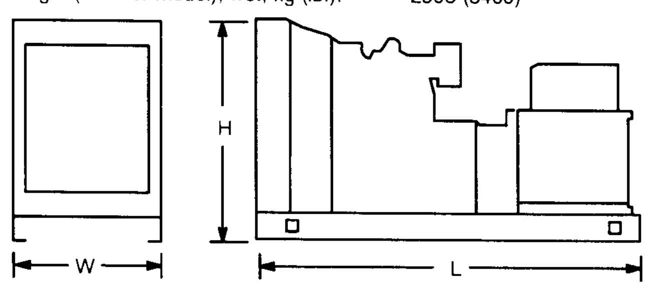
Miscellaneous Accessories

- ❑ ______________________________
- ❑ ______________________________
- ❑ ______________________________
- ❑ ______________________________
- ❑ ______________________________
- ❑ ______________________________

Dimensions and Weights

Overall Size, L x W x H, mm (in.): 3500 x 1250 x 1941 (137.8 x 49.2 x 76.4)

Weight (radiator model), wet, kg (lb.): 2903 (6400)



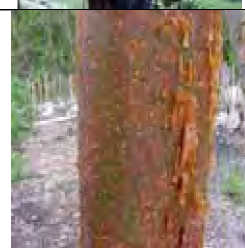
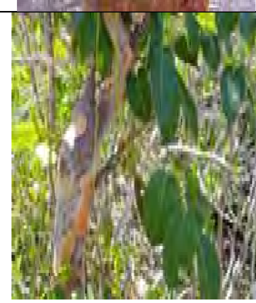
NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

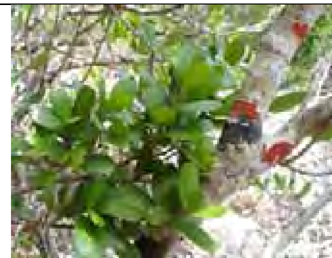
DISTRIBUTED BY:

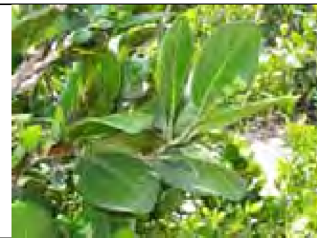
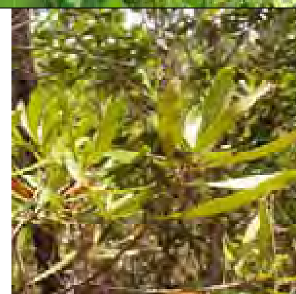
The table below lists species known to occur on-site that will be retained where possible and incorporated in landscaping plans. This list may be added to or modified.

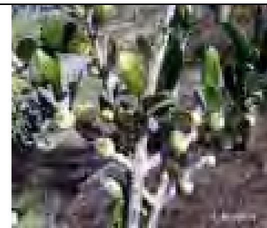
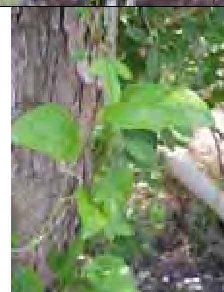
TABLE 1

Species	Latin Name	Photograph	Fruiting Characteristic(s)	Potential Usage/known pollinator(s)
Thatch Palm	*Thrinax morrisii*		Round, brown drupe.	Provides significant food and cover for wildlife.
Silver thatch palm	*Coccothrinax argentata*		Round white drupe.	Provides significant food and cover for wildlife
Wild coffee	*Psychotria nervosa*		Edible red drupe.	Provides significant food and cover for wildlife. Nectar plant for atala (*Eumaeus atala*), great southern white (*Ascia monuste*), julia (Dryas iulia), Schaus' swallowtail (*Heraclides aristodemus)* and other butterflies. Birds and other animals eat the fruits.

Wild guava	*Tetrazygia bicolor*		Purplish or purplish-black berry.	Provides food for birds.
Mahogany	*Sweitena mahogoni*		Woody capsule splitting open to expose reddish-brown winged seeds.	Host of the mahogany mistletoe (*Phoradendron rubrum*), endangered in Florida.
Gumbo Limbo	*Bursera simaruba*		Greenish-brown to red-purple fleshy capsule, separating into three sections at maturity, exposing one or two reddish seeds.	Provides moderate amounts of food and cover for wildlife. Larval host plant for dingy purplewing (*Eunica monima*) butterflies. Kingbirds and other flycatchers eat the fruits.
Poisonwood	*Metopium toxiferum*		Orange 3/4" long drupe.	Provides food and cover for wildlife. Nectar plant for Bahamian swallowtail (*Heraclides andraemon*), Florida white (*Appias drusilla*), julia (Dryas iulia), large orange sulphur (*Phoebis agarithe*) and other butterflies. White-crowned pigeons eat the fruit during nesting season.

Darling plum	*Reynosia septentrionalis*		Purple to black drupe.	Provides food and cover for wildlife.
Strongback	*Bourreria ovata*		Bright orange to reddish-orange drupe.	Provides significant food and cover for wildlife, including hummingbirds and other small animals. Nectar plant for Bahamian swallowtail (*Heraclides andraemon*), giant swallowtail (*Heraclides cresphontes*), julia (*Dryas iulia*), large orange sulphur (*Phoebis agarithe*) and other butterflies.
Locustberry	*Byrsonima lucida*		Reddish brown, berry-like drupe.	Provides food and cover for birds.
Rams horn	*Pithecellobium keyense*		Reddish-brown coiled pod (legume) splitting open to expose black seeds with a red aril.	Larval host plant for cassius blue (*Leptotes cassius*) and large orange sulphur (*Phoebis agarithe*) butterflies. Nectar plant for cassius blue, giant swallowtail (*Heraclides cresphontes*), great southern white (*Ascia monuste*), large orange sulphur and other butterflies. Birds eat the arils.

Pigeon plum	*Coccoloba diversifolia*		Dark red to purple berry-like achene, 1/3" long, in clusters.	Provides significant food and cover for wildlife. Nectar plant for large orange sulphur (*Phoebis agarithe*), Schaus' swallowtail (*Heraclides aristodemus*) and other butterflies. Birds and other animals eat the fruits.
Wax myrtle	*Myrica cerifera*		Small, waxy bluish drupe	Provides significant food and cover for wildlife.
Wild allamanda	*Urechites lutea*		Two-parted pod of elongated, slender incurved follicles	Larval host plant for polka-dot (*Syntomeida epilais*) wasp moths
Blolly	*Guapira discolor*		Bright red berrylike drupe.	Provides significant food and cover for wildlife. Birds eat the fruits.

Indigo berry	*Randia aculeata*		White berry with indigo pulp	Provides significant food and moderate amounts of cover for wildlife. Nectar plant for Schaus' swallowtail (*Heraclides aristodemus*) and other butterflies
Passion vine	*Passiflora suberosa*		Purple-black globose berry.	Larval host plant for gulf fritillary (*Agraulis vanillae*), julia (*Dryas iulia*) and zebra longwing (*Heliconius charitonius*) butterflies. Nectar for hummingbirds.
Sea grape	*Coccoloba uvifera*		Berry-like achene, purple when mature.	Provides moderate amounts of food and significant cover for wildlife. Nectar plant for julia (*Dryas iulia*), Schaus' swallowtail (*Heraclides aristodemus* and other butterflies. Larger wildlife eat the fruits.

Other native species under consideration for planting plans include: Satinleaf (*Chrysophyllum oliviform)*, a variety of native figs, Lignum vitae (*Guaicum officinale*), Sarahs Toe (*Peltophorum adnatum*), Geiger tree (*Cordoba sebestena*), Cocoplum (*Chrysobalanus icaco*), Yellow elder (*Tecoma stans*) and wild sage, (*Lantana* spp.).
Portions of the information presented above were obtained from the Institute of Regional Conservation (www.regionalconservation.org) and from local resident Mr. Pericles Maillis.

APPENDIX VIII

MASTER DECLARATION OF COVENANTS, CONDITIONS & RESTRICTIONS

MASTER DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS FOR ALBANY

Proposed form, subject to change without notice
by the Declarant in the Declarant's sole discretion

TABLE OF CONTENTS

MASTER DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS FOR ALBANY

THIS MASTER DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS for the development known as Albany ("Master Declaration") is made this _____ day of _______________, 20__ by, Park Ridge Securities Corp., a limited liability company incorporated, duly organized and validly existing under the laws of The Bahamas (hereinafter referred to as "Declarant"), and joined by Albany Community Association, Ltd., a Bahamian non-profit company incorporated, duly organized and validly existing under the laws of The Bahamas (hereinafter referred to as the "Association").

A. Declarant owns that certain real property located in the Island of New Providence, one of the Islands of The Bahamas as defined in this Master Declaration as the "Property," which is further described on Exhibit "A" attached hereto and made a part hereof.

B. Declarant intends to develop the Property (including any Additional Property added thereto) in accordance with this Master Declaration as a master planned residential community to be known as "Albany".

C. Declarant has caused Albany Community Association, Ltd., an association comprised of all owners of real property in Albany, to be formed for the purposes set forth in this Master Declaration and the other Governing Documents as defined herein.

STATEMENT OF MASTER DECLARATION

The Property shall be owned, sold, conveyed and used subject to the following covenants, conditions, restrictions, reservations, assessments and other provisions set forth in this Master Declaration, which shall run with the Property. This Master Declaration shall be binding upon all parties having any right, title, or interest in any part of the Property, their heirs, successors, successors-in-title and assigns, and shall inure to the benefit of each Owner (as hereinafter defined) thereof and which shall read as follows:

ARTICLE I
DEFINITIONS

The terms used in the Governing Documents shall generally be given their natural, commonly accepted definitions, unless otherwise defined. The word "may" shall be construed as permissive and the word "shall" shall be construed as imperative. Words importing the singular number shall include the plural number and vice versa and words importing the masculine gender shall include the feminine gender. Capitalized terms shall be defined as set forth below:-

"**Additional Property**" shall mean the real property described on Exhibit "B" attached hereto and made a part hereof, which may be subjected to this Master Declaration by Declarant from time to time in accordance with the terms of this Master Declaration. Prior to the Turnover Date (as hereinafter defined), Declarant may unilaterally modify Exhibit "B" by adding or removing any property therefrom as Declarant, in its sole and absolute discretion may determine appropriate.

"**Albany Yacht Club**" shall mean Albany Yacht Club, Ltd. or one of its successors, assigns or affiliates, doing business as Albany Marina, which shall own and/or lease the Marina Property,.

"**Architectural Review Committee**" or "**ARC**" or "**Town Architect**" shall mean the committee formed or Person designated by Declarant to promulgate, design and develop guidelines and application and review procedures for new construction upon the Property and any modifications to improvements and to review and approve the plans for same.

"**Area of Common Responsibility**" shall mean and refer to the Common Area, together with such other areas, if any, which by the terms of this Master Declaration, any Supplemental Declaration, a resolution of the Board of Directors of the Association, or an agreement with any Person or a governmental agency, shall become the responsibility of the Association, including without limitation any canals, lakes, reservoirs or other public areas located within, adjoining or adjacent to the Property designated by Declarant as part of the Area of Common Responsibility.

"**Articles" or "Articles of Association**" shall mean the Articles of Association of Albany Community Association, Ltd., as the same may be amended from time to time, and filed with the Registrar of Companies of The Bahamas

"**Assessment**" shall mean and refer to charges levied against Lots to fund Common Expenses, Neighborhood Expenses and any other expenses of the Association and shall include Common Assessments, Special Assessments and Neighborhood Assessments.

"**Association**" shall mean and refer to the Albany Community Association, Ltd. and its successors or assigns. The Association is the master association for the entire Community. Declarant reserves the right to create separate sub-associations called "Neighborhood Associations" which may be created for particular Neighborhoods within the Community.

"**Bahamas**" or "**The Bahamas**" shall mean the sovereign and independent country known as "the Commonwealth of The Bahamas".

"**Board of Directors**" or "**Board**" shall mean and refer to the governing body responsible for the administration of the Association.

"**Club**" shall mean Albany Golf & Beach Club, Ltd. or one of its successors, assigns or affiliates, doing business as Albany Golf & Beach Club, which shall own and operate the Club Property.

"**Club Membership Plan Documents**" shall mean and consist of the membership plan, the rules and regulations, membership agreements, frequently asked questions, schedule of dues, fees and charges and purchaser's acknowledgement all related to membership interests in the Club, as any of the same may be amended from time to time.

“**Club Property**” shall mean all of the real and personal property and any improvements and recreational and social facilities constructed thereon located within, adjoining or adjacent to Albany, which are owned and operated by Persons other than the Association for recreational and related purposes on a club membership basis or otherwise and commonly known as Albany Golf & Beach Club as the same is more specifically delineated on the Master Plan. The Club Property shall include without limitation, the golf course, golf practice facilities, beach club (including the Albany House), water park, fitness center, swimming and tennis facilities and the golf clubhouse and such other property as may be included from time to time. **THE CLUB PROPERTY AND MARINA PROPERTY ARE NOT COMMON AREA**.

“**Common Area**” or “**Common Areas**” shall mean all of the real and personal property, including easements, which the Association owns, leases, or otherwise holds possessory or use rights in, plus all property designated as Common Areas in any future Supplemental Declaration or any portion of a plat or replat of the Property dedicated to or for the Association together with any improvements thereon, which are intended for the common use and enjoyment of all Members of the Association. Common Area shall also include the Exclusive Common Area, unless the context otherwise requires.

“**Common Assessments**” shall mean those Assessments for which all Members of the Association are responsible to pay to defray Common Expenses.

“**Common Expenses**” shall mean the actual and estimated costs and expenses incurred or expected to be incurred by the Association for the general benefit of all Owners, including any reasonable reserve, for the deferred maintenance, repair, replacement or reconstruction of Common Area, all as may be authorized by the Board of Directors.

“**Community**” shall mean the master planned residential community to be known as Albany.

“**Community-Wide Standards**” shall mean the standards of conduct, maintenance, or other activity generally prevailing throughout the Community or the minimum standards established pursuant to the Design Guidelines, Rules and Regulations and Board Resolutions, whichever is the highest standard. Declarant shall initially establish such standard and such standards may evolve as the development of the Community progresses and the needs and desires within the Community changes.

“**Declarant**” shall mean and refer to Park Ridge Securities Corp., a limited liability company incorporated, duly organized and existing under the laws of The Bahamas or one (1) of its successors or assigns provided such successor or assign is designated as Declarant by the immediately preceding Declarant in a recorded instrument executed in accordance with the terms of this Master Declaration. Declarant may assign all or part of its rights hereunder by a Supplemental Declaration.

“**Declarant Retained Land**” shall mean property owned and retained by Declarant within, adjacent to or adjoining Albany, including but not limited to, the Club Property and each and every part thereof and shall also include the property described in **Exhibit C**, as well as such additional property forming a part of the Property as Declarant shall retain and as evidenced and legally described in a recorded Supplemental Declaration. Declarant Retained Land shall be released from the terms of this Master Declaration once legally described by a recorded Supplemental Declaration.

"**Design Guidelines**" shall mean the architectural, design and construction guidelines and application and review procedures adopted pursuant to Article VII of this Master Declaration, as they may be amended or supplemented from time to time.

"**Exclusive Common Area**" shall mean and refer to certain portions of the Common Area, including any improvements and fixtures thereon, the use of which has been granted exclusively or primarily to one (1) or more, but less than all, Lots or Neighborhoods for the common use and enjoyment of Owners of such Lots or the Owners of the Lots within such Neighborhoods. Such Exclusive Common Area shall be designated by Supplemental Declaration, a Neighborhood Declaration or otherwise. All costs associated with the maintenance, repair, replacement and insurance of an Exclusive Common Area shall be assessed only against the Owners of the Lots benefited by such Exclusive Common Area.

"**The Governing Documents**" shall mean and consist of:-

(i) this Master Declaration and each recorded Supplemental Declaration,

(ii) the respective Conveyance of Unit by Declarant applicable to an Owner,

(iii) Memorandum of Association of Albany Community Association, Ltd.,

(iv) Articles of Association of Albany Community Association, Ltd.,

(v) Rules and Regulations of Albany Community Association, Ltd.,

(vi) Design Guidelines described in Article VII, and

(vii) Resolutions of the Board of Directors of Albany Community Association, Ltd. that effect the use rights and any other Governing Documents,

all as they may be amended from time to time.

"**Institutional Mortgagee**" shall mean: (a) any generally recognized lending institution having a first mortgage lien upon a Lot or (b) such other lenders as the Board of Directors shall hereafter approve in writing which have acquired a first mortgage lien upon a Lot.

"**Lot**"

(a) shall be an inclusive term referring to a portion of the Property, whether developed or undeveloped, intended for development, use, and occupancy as a residence and shall, unless otherwise specified, include within its meaning by way of illustration, but not limitation, cottages, condominium units, villas, patio homes, and single-family homes, as well as vacant land intended for development as such, all as may be developed, used and defined as herein provided or as provided in a Supplemental Declaration covering all or a part of the Property. The term shall include all portions of the Lot owned as well as any structure thereon. In the case of a structure which contains multiple single family dwellings, each single family dwelling shall be deemed to be a separate Lot. For the avoidance of doubt, the term Lot does not include a parcel of land designated for the development of a single family dwelling that contains other structures, which form an integral part of the single family dwelling such as a shed, detached garage, guest house or maid quarters.

(b) In the case of a parcel of vacant land or land on which improvements are under construction, the parcel shall be deemed to contain the number of Lots designated for residential use for such parcel on the site plan approved by Declarant until such time as a subdivision plat has been recorded in the Registry of Records of The Bahamas on all or a portion thereof. After a subdivision plat has been recorded on all or a portion thereof, the portion designated in that plat shall constitute a separate Lot or Lots as determined by paragraph (a) above and the number of Lots on the remaining land, if any, shall continue to be determined in accordance with this paragraph (b).

(c) The term "Lot" shall not include the Club Property, including but not limited to, the golf course, golf practice facilities, beach club, water park, fitness center, swimming and tennis facilities and the golf clubhouse.

"**Marina Property**" shall mean all of the real and personal property (including the water bodies, waterways and land thereunder) and any improvements and recreational and social facilities constructed thereon located within, adjoining or adjacent to Albany, which are owned and operated by Persons other than the Association for use as a marina for boats and other water crafts and commonly known as Albany Marina, as the same is more specifically delineated on the Master Plan and as the same may be amended by Declarant from time to time through the addition or removal of any property therefrom.

"**Master Declaration**" shall mean this document, as the same may be amended or supplemented from time to time.

"**Master Plan**" shall mean and refer to the plan for the development of the Property, as the same may be amended or supplemented from time to time.

"**Member**" shall mean and refer to a Person entitled to membership in the Association. All Owners shall be Members of the Association; provided, however, that there shall be no more than one (1) Member for each Lot. In addition, Declarant shall also be a Member of the Association as described more fully in Article IX hereof and the Articles of Association.

"**Memorandum**" shall mean and refer to the Memorandum of Association of Albany Community Association, Ltd., as the same may be amended from time to time, and filed with the Registrar of Companies of The Bahamas.

"**Neighborhood**" shall mean and refer to any grouping of Lots which are designated as a separate Neighborhood by Declarant in a Supplemental Declaration, in which the Owners thereof may have common interests other than those common to all Owners (such as a common theme, entrance feature, development name and/or common area and facilities) or receive other benefits or services from the Association which are not available for use by all Owners. A Neighborhood may consist of more than one housing type and may include noncontiguous parcels of property. If the Association provides benefits or services to less than all Lots within a particular

Neighborhood, then the cost of such services shall be levied against just the benefited Lots. Declarant reserves the right to have each Neighborhood governed by a separate Neighborhood Association, in addition to governance by the Association.

"**Neighborhood Assessments**" shall mean assessments levied by either the Association or a Neighborhood Association against the Lots in a particular Neighborhood or Neighborhoods to fund Neighborhood Expenses, as more particularly described in Section 10.5 of this Master Declaration.

"**Neighborhood Association**" shall mean any neighborhood association or committee, condominium association or such other entity, its successors and assigns, which shall be responsible for administering any Neighborhood concurrent with (but subject to) the administration of the Association. A Neighborhood may but shall not be required to have a Neighborhood Association unless it is subject to the condominium form of ownership.

"**Neighborhood Declaration**" shall mean any recorded instrument containing protective covenants, conditions, restrictions and other provisions (if any) imposed upon one or more Neighborhoods. A Neighborhood may, but shall not be required, to have a Neighborhood Declaration.

"**Neighborhood Governing Documents**" shall mean a Neighborhood Declaration together with the memorandum of association and articles of association of the Neighborhood Association (if any), the rules and regulations and the resolutions of the directors of the Neighborhood Association of a Neighborhood (if any) that effect the use rights and any other Neighborhood Governing Documents.

"**Neighborhood Expenses**" shall mean and include those actual and estimated expenses incurred or expected to be incurred by the Association primarily for the benefit of the Owners of Lots within a particular Neighborhood or Neighborhoods, which may include a reasonable reserve for deferred maintenance, repairs, and replacements, all as may be authorized from time to time by the Board of Directors of the Association or the applicable Neighborhood Association and as more particularly authorized herein.

"**Owner**" shall mean and refer to the record owner of the fee simple title to a Lot (including Declarant and Sub-developers, but specifically excluding any party holding an interest merely as security for the performance of an obligation, unless such party takes fee simple title to the Lots free of any right of redemption). The term Owner may also include any other Person who owns any portion of the Property other than the Association.

"**Person**" means any natural person, corporation, partnership, trustee or other legal entity.

"**Property**" shall mean and refer to the real property legally described on Exhibit "A" attached hereto, together with such additional property as is hereafter subjected to this Master Declaration by a Supplemental Declaration.

"**record**", "**recorded**" and "**recording**" shall mean the lodgment of a deed or legal instrument in the Registry of Records of The Bahamas, or such other registry as may be designated as the official location for recording deeds and similar instruments affecting title to real estate.

"**Rules and Regulations**" shall mean the rules and regulations for the use, occupancy and enjoyment of the Community, as they may be supplemented, modified and repealed pursuant to this Master Declaration.

"**Special Assessment**" shall mean and refer to assessments levied in accordance with Section 10.6 hereof.

"**Sub-developer**" shall mean a Person who acquires one (1) or more Lots for the purpose of constructing a Unit on it for resale or who acquires one (1) or more parcels of land within Albany for further subdivision, development and/or resale in the ordinary course of business.

"**Supplemental Declaration**" shall mean a recorded supplement to this Master Declaration executed by or consented to by Declarant in accordance with Section 2.2 hereof.

"Town Home" shall mean a single-family dwelling with at least one party wall.

"**Turnover Date**" shall mean the date on which the earlier of the following shall occur (i) 60 days after Declarant no longer owns any portion of the Property or the Additional Property (excluding Declarant's Retained Land) or (ii) such earlier date, as determined in Declarant's sole and absolute discretion, that Declarant converts its Class "B" Membership into Class "A" Membership.

"**Unit**" shall mean and refer to any structure constructed on a Lot which is intended for use and occupancy as a residence, including without limitation, a cottage, a condominium unit, villa, a patio home, a Town Home and a single-family home.

ARTICLE II
GENERAL PLAN FOR DEVELOPMENT

2.1 PLAN FOR DEVELOPMENT

(a) In General. Declarant plans to develop the Property as a multi-phased residential community in accordance with the Master Plan and subject to any required governmental approvals. Declarant reserves the unilateral right to (i) develop any portion of the Property for commercial uses in accordance with this Master Declaration, the Master Plan and any applicable governmental approvals and (ii) modify the Master Plan in its sole discretion from time to time and the consent of the Association, any Owner and any mortgagee of any Owner shall not be required in connection therewith prior to the Turnover Date. After the Turnover Date, Declarant shall obtain the written consent of the Association in connection with any modification of the Master Plan, provided that, Declarant shall continue to enjoy the unilateral right to develop any portion of Declarant's Retained Land after the Turnover Date in a manner determined by Declarant in its sole discretion, subject to any required governmental approvals.

(b) Master Declaration; Association. This Master Declaration is not a declaration of condominium. No portion of the Property is submitted by this Master Declaration to the condominium form of ownership. Declarant has caused the Association to be formed to perform certain administrative and operational functions regarding the Property as set forth more fully in the Governing Documents.

(c) Neighborhoods. Declarant intends that Lots may, but need not be, grouped together in residential Neighborhoods designated by Declarant prior to the Turnover Date and thereafter by the Association pursuant to one or more recorded Supplemental Declarations. Neighborhoods may, but are not required, to be administered by Neighborhood Associations.

2.2 SUPPLEMENTAL DECLARATIONS

Declarant shall have the right, alone and in its sole discretion, to execute and record, Supplemental Declarations from time to time containing provisions which (a) assign a specific use to a portion of the Property; (b) designate a Neighborhood and any specific uses or provisions with respect to the Neighborhood; (c) impose additional restrictions or delete restrictions on a portion of the Property; (d) assign some or all of Declarant's rights and obligations hereunder; (e) subject some or all of the Additional Property to the effect of this Master Declaration; and/or (f) do anything else permitted by this Master Declaration. A Supplemental Declaration shall be effective upon recording, unless otherwise specified therein.

2.3 NEIGHBORHOOD DECLARATION

Prior to the Turnover Date, Declarant, or another Person with Declarant's prior written consent, may record instruments subjecting a Neighborhood designated by Declarant or another Person with Declarant's prior written consent to a Neighborhood Declaration, upon which event the subject property shall then be subject to both this Master Declaration and such Neighborhood Declaration. After the Turnover Date, the Association shall have the sole right to subject a Neighborhood to a Neighborhood Declaration. Such Neighborhood Declaration may also create a Neighborhood Association, and such Neighborhood Association may have the same, additional, or different rights, powers, duties or privileges with respect to such Neighborhood as the Association, in which event such Neighborhood may be subject to the jurisdiction of both the Neighborhood Association and the Association, and may cause the Owners of Lots within the Neighborhood to be members of the Neighborhood Association under such terms and conditions as may be provided therein, which may be the same as or substantially different from the terms and conditions of membership in the Association as provided herein. Neighborhood Governing Documents may impose additional covenants, restrictions, stipulations and easements on some but not all Neighborhoods. When there is a conflict between the Governing Documents and the Neighborhood Governing Documents, the Governing Documents shall prevail over Neighborhood Governing Documents, except to the extent that the Neighborhood Governing Documents establishes a higher or stricter standard or requirement or is required by law (for example a declaration of condominium).

2.4 ANNEXATION OF ADDITIONAL PROPERTY

(a) Prior to the Turnover Date. Prior to the Turnover Date, Declarant shall have the right, privilege, and option, in its sole discretion, to subject any Additional Property to the provisions of this Master Declaration and to the administration of the Association by recording a Supplemental Declaration containing a legal description of the additional property to be subjected. Such Supplemental Declaration shall not require the consent of any Person except the owner of such Additional Property, if other than Declarant. Any such annexation shall be effective upon the recording of such Supplemental Declaration, unless otherwise provided therein. Declarant shall have the right, in its sole discretion, to transfer to any other Person the right, privilege, and option to annex additional property, which is reserved herein to Declarant, provided that such transfer is memorialized in a recorded Supplemental Declaration. Nothing in this Master Declaration shall be construed to require Declarant or any successor to subject Additional Property to this Master Declaration or to develop any of the property described in Exhibit B in any manner whatsoever.

(b) After the Turnover Date. Following the Turnover Date, Declarant shall have the unilateral right, privilege and option, until all of the Additional Property has been subjected to this Master Declaration, to subject all or any portion of the Additional Property to the provisions of this Master Declaration and the jurisdiction of the Association from time to time and at any time all or any portion of the Additional Property. Such annexation shall be accomplished by a recorded Supplemental Declaration annexing such Additional Property. Such Supplemental Declaration shall not require the consent of any Person, but shall require the consent of the owner of such property, if other than Declarant. Any such annexation shall be effective upon the recording of such Supplemental Declaration unless otherwise provided therein.

Following the Turnover Date, the Association may not subject any property to the provisions of this Master Declaration and the jurisdiction of the Association without: (a) the affirmative vote of a majority of the Class "A" Members of the Association either in writing or present, in person or by proxy, at a meeting duly called for such purpose, (b) the consent of the owner of such property, (c) the consent of the Club, (d) the consent of the Albany Yacht Club, and (e) the consent of Declarant so long as Declarant owns any portion of the Property or the Additional Property. Such Supplemental Declaration shall be signed by the authorized signatories of the Association, by the owner of the property, the authorized signatories of the Club and Declarant, where Declarant's consent is required.

2.5 AMENDMENT OF ARTICLE

This Article shall not be amended without the prior written consent of (i) Declarant, so long as Declarant owns any portion of the Property or the Additional Property, (ii) the Club and (iii) the Albany Yacht Club.

ARTICLE III
LAND DESIGNATION AND ADMINISTRATION

3.1 IN GENERAL

The Property may be subjected to designated uses in accordance with the terms of this Master Declaration, by any Supplemental Declaration or by any other reasonable means by Declarant. Declarant may, in its sole and absolute discretion, establish any use for the Property consistent with the terms of the Master Plan, this Master Declaration and applicable law. Without limiting the foregoing, the Property may be used in the following manner:

(a) Residential Areas. Residential areas shall be those areas used for residential use, which shall include Lots and improvements associated with residential purposes and uses including, but not limited to streets, driveways, sidewalks, entranceways, street lighting, open spaces, parking spaces, landscaping, swimming pools, other recreational facilities and other areas or amenities appurtenant to the Lots. Unless otherwise provided in a Supplemental Declaration or Neighborhood Governing Documents, each Owner shall be responsible for the maintenance of his or her Lot.

(b) Common Area, Exclusive Common Area

(1) In General: Declarant grants to each Owner and his or her licensees or invitees a non-exclusive easement of use, access and enjoyment in and to the Common Area, subject to (i) the Governing Documents, (ii) any restrictions or limitations contained in any deed conveying such property to the Association and (iii) the rights of certain Owners to the exclusive use of those portions of the Common Area designated "Exclusive Common Area". An Owner who leases his or her Unit shall be deemed to have assigned all such rights to the Unit's lessee for the period of the lease.

Declarant shall determine the manner of making improvements to all Common Area and the use thereof so long as Declarant owns any portion of the Property or the Additional Property, and, thereafter, the Association shall have the same right provided the general quality of the Community is not materially and detrimentally changed.

(i) Administration and Operation: The Association is the entity responsible for the management, maintenance, operation and control of the Area of Common Responsibility provided that the Association may assign or delegate such responsibility, in whole or in part, exclusively or non-exclusively, and permanently or temporarily, for any portion of the Common Area to a Neighborhood Association, the Club, a governmental entity or any other Person determined to be appropriate by Declarant so long as Declarant owns any portion of the Property or the Additional Property with the consent of the accepting party. After Declarant no longer owns any portion of the Property or the Additional Property, the Board of Directors of the Association shall determine by a majority vote whether the assignee is appropriate.

(ii) Certain Declarant Rights: Declarant shall have the right, so long as Declarant owns any portion of the Property or the Additional Property, to, in its sole and absolute discretion, alter the boundaries of the Common Area and construct, develop or modify the Common Area and any improvements, easements and use rights thereon or appurtenant thereto in a manner determined appropriate by Declarant, in its sole discretion, without the joinder or consent of any Person, including, without limitation, the Association, any Neighborhood Association, any Owners or any mortgagee of any Owner, provided all applicable zoning requirements are met and governmental approvals (if required) have been obtained.

(iii) Declarant Approval: The Association shall not abandon, partition, alienate, release, transfer, hypothecate, or otherwise encumber the Common Area so long as Declarant owns any portion of the Property or the Additional Property without the prior written approval of Declarant and, thereafter, without the prior approval of the Members representing a majority of the Class "A" Members eligible to vote. The preceding sentence shall not prohibit the Association from granting such easements over, under and above Common Area as are reasonably necessary or appropriate for the development and operation of the Property in a manner consistent with the provisions of this Master Declaration, nor shall the foregoing prohibit the Association from encumbering Common Area provided such encumbrances are solely to secure loans obtained for improving Common Area, and the lien of such encumbrance is not superior to the provisions of this Master Declaration.

(iv) Exclusive Common Area: Certain portions of the Common Area may be designated as Exclusive Common Areas and reserved for the exclusive use of Owners and occupants of Lots within a particular Neighborhood or Neighborhoods. By way of illustration and not limitation, Exclusive Common Areas may include recreational facilities and other portions of the Common Area intended for the exclusive use of Owners within a particular Neighborhood or Neighborhoods. All expenses and cost arising from the maintenance, repair, replacement and insurance of an Exclusive Common Area shall form a part of the Neighborhood Assessment of the Neighborhood(s) to which the Exclusive Common Area is reserved and allocated among the Owners in such Neighborhood(s). Any Exclusive Common Area shall be designated by Declarant by Supplemental Declaration and thereafter by approval of the Directors of the Association; provided that, so long as Declarant owns any portion of the Property or Additional Property, any such designation by the Association shall also require the consent of Declarant. Subject to the consent of a majority of the Owners of Units or Lots within a Neighborhood with respect to which the use of Exclusive Common Property is reserved, Declarant and where applicable the Association may permit Owners of Units or Lots in other Neighborhoods to use all or any portion of the Exclusive Common Area upon payment of reasonable user fees, which fees shall be used to offset the Neighborhood Expenses attributable to the maintenance, repair, replacement and insurance of an Exclusive Common Area.

(c) Other Uses. Declarant may use any portion of the Property for commercial purposes. Any such use shall be designated by Declarant in a recorded Supplemental Declaration, and Declarant may, in any such Supplemental Declaration, set forth any restrictions, conditions and covenants that run with such portion of the Property. Declarant may also set forth any rights and obligations of the Owner of such portion of the Property, and the manner in which such portion of the Property shall be administered and assessed under this Master Declaration. Notwithstanding the foregoing, a portion of the Property may be used as a sales center for the sale, resale or rental of Lots and Units within the Community or other communities designated by Declarant and/or memberships in the Club. Declarant may assign, in whole or in part, its rights under this Section 3.1(c).

3.2 DISPUTES AS TO USE

If there is any dispute as to whether the designation of any portion of the Property complies with this Master Declaration, any Supplemental Declaration, or any other documents, then, so long as Declarant owns any portion of the Property or the Additional Property, the dispute shall be referred to Declarant. After Declarant no longer owns any portion of the Property or the Additional Property, the dispute shall be referred to the Association. The determination rendered by Declarant or the Association, as the case may be, shall be final and binding on all Persons involved in the dispute.

ARTICLE IV
PARTY WALLS

Each wall, fence, driveway or similar structure built as a part of the original construction which serves and/or separates any two adjoining Town Homes or two Lots shall constitute a party wall or structure.

The cost of reasonable repair and maintenance of a party wall or structure shall be shared equally by the Owners who make use of the party wall or structure.

If a party wall or structure is destroyed or damaged by fire or other casualty, then to the extent that such damage is not covered by insurance and repaired out of the proceeds of insurance any Owner who has used the party wall or structure may restore it. If other Owners thereafter use the party wall or structure, they shall contribute to the restoration cost in equal proportions. However, such contribution will not prejudice the right to call for a larger contribution from the other users under any rule of law regarding liability for negligent or willful acts or omissions. The right of any Owner to contribution from any other Owner under this Section shall be appurtenant to the land and shall pass to such Owner's successors-in-title.

To the extent not inconsistent with the provisions of this Section, the general rules of law regarding party walls and structures and liability for property damage due to negligence or willful acts or omissions shall apply thereto.

ARTICLE V
DEVELOPMENT OF COMMON AREAS

5.1 CONSTRUCTION AND INSPECTION OF COMMON AREA

Declarant (or a Sub-developer) will construct, furnish and equip, at its sole cost and expense, the Common Area.

5.2 TRANSFER OF COMMON AREA

On or before the Turnover Date, Declarant agrees to convey, transfer, assign and deliver to the Association, and the Association shall accept from Declarant, Declarant's interest in the Common Area as the same exists on the date of conveyance. The Association shall be responsible for the full payment of all stamp duty arising out of such transfer and each party shall bear its own attorneys fees.

ARTICLE VI
USE RESTRICTIONS

6.1 IN GENERAL

The Property shall be used only for residential, recreational, resort, commercial and other related business purposes, which purposes may include, without limitation, offices for any property manager retained by the Association or business, sales, or real estate offices for Declarant or the Association and other businesses which serve and are a part of the Community, as may more particularly be set forth in this Master Declaration and amendments hereto. Any Supplemental Declaration or additional covenants imposed on the property within any Neighborhood may impose stricter standards than those contained in this Article. The Association, acting through its Board of Directors, shall have standing and the power to enforce such standards. The Association, acting through its Board of Directors, shall have authority to make, and the Association acting through its Board of Directors shall have the authority to enforce, standards and restrictions governing the use of the Property in addition to those contained herein and in the Community-Wide Standards. Such regulations and use restrictions shall be binding upon all Owners, occupants, invitees and licensees. Notwithstanding anything to the contrary herein, Declarant's Retained Property and the Club Property shall be exempt from application of the provisions of this Article.

(a) Accessory Structures. Dog houses, tool sheds or structures of a similar kind or nature are not permitted on any part of the Property.

(b) Air Conditioning Units. Except as may be permitted by the Town Architect or the ARC, no window air conditioning units may be installed in any Unit.

(c) Animals and Pets. No animals, reptiles, livestock, wildlife or poultry of any kind shall be raised, bred or kept on any portion of the Property, except that no more than a total of two (2) dogs, cats, fish or other usual and common household pets may be permitted on a Lot. However, pets which are permitted to roam free, or which, in the sole discretion of the Board of Directors, endanger the health and safety of the Owners, make objectionable noise, or constitute a nuisance or inconvenience to the other Owners shall be removed upon request of the Board of Directors. If the Owner fails to honor such request, the pet may be removed by the Board of Directors. No pets shall be kept, bred or maintained for any commercial purpose. All pets must be registered, licensed and inoculated as required by applicable law. Household pets shall at all times whenever they are outside the Owner's Unit be confined on a leash held by a responsible person. Should a pet defecate on any portion of the Common Area, the Owner of the pet shall immediately clean up after such pet.

(d) Antennas, Satellite Dishes. Except as otherwise provided by law, standard TV antennas and satellite dishes which are one meter in diameter or less shall be permitted on the Property provided such over-the-air reception devices comply with all Design Guidelines, screening and landscaping requirements, and other applicable restrictions and Rules and Regulations pertaining to the location and manner of installation. Declarant and the Association shall have the right, without obligation, to erect or install and maintain any such apparatus for the benefit of all or a portion of the Property.

(e) Artificial Vegetation, Exterior Decorations, and Similar Items. No artificial vegetation shall be permitted on any Lot. Exterior decorations, including without limitation, sculptures, fountains, flags, and similar items must be pre-approved by the Town Architect or the ARC.

(f) Business Use. No business, trade, or similar activity may be conducted in or from any Unit, except as provided in this Paragraph, and except that an Owner or Occupant residing in a Unit may conduct "discrete business activities" within the Unit so long as the existence or operation of the business activity is not apparent or detectable by sight, sound, or smell from outside the Unit; the business activity does not involve regular visitation of the Unit or door-to-door solicitation of residents of the Property; and the business activity is consistent with the character of the Property and does not violate these Use Restrictions, the Owner or occupant of the Unit does not install, place or maintain any signage, billboards or advertising materials to advertise the business activity. Examples of "discrete business activities" include, but are not limited to, computer-based telecommunications and literary, artistic, or craft activities. The Board may restrict any business activities in Units that it determines interfere with the use and enjoyment of the Property in its sole, absolute and unfettered discretion.

The leasing of a Unit in accordance with these Use Restrictions and Rules and Regulations shall not be considered a business or trade within the meaning of this subsection. This subsection shall not apply to any activity conducted by Declarant or a Sub-developer approved by Declarant with respect to its development and sale of Property or its use of Units which it owns within the Property.

The terms "business" and "trade", as used in this provision, shall be construed to have their ordinary, generally accepted meanings, and shall include, without limitation, any occupation, work or activity undertaken on an ongoing basis which involves the provision of goods or services to Persons other than the provider's family and for which the provider receives a fee, compensation, or other form of consideration, regardless of whether: (i) such activity is engaged in full or part-time; (ii) such activity is intended to or does generate a profit; or (iii) a license is required therefor. This Article shall not apply to any activity conducted by the Declarant with respect to its development and sale of the Property or its use of any Lots or Units which it owns within the Property.

(g) Clotheslines, Garbage Cans, Tanks. Clotheslines, garbage cans, storage tanks, mechanical equipment, including, without limitation, electrical meters, gas meters and air conditioning compressors, or other similar items shall be located or screened so as to be concealed from view of neighboring Lots, streets and the Club Property. All rubbish, trash, and garbage shall be stored in approved containers with lids and regularly removed from the Property and shall not be allowed to accumulate thereon except between regular garbage pick-ups. All basketball hoops, backboards, storage tents, mechanical equipment, garbage can storage structures and other such items shall be subject to the pre-approval of the Town Architect or the ARC.

(h) Conversion of Carport, Garage, Patio, Porch or Verandah. No conversion of any carport, garage, patio, porch or verandah to finished spaced for use as an apartment or other integral part of the living area of any Unit is permitted without prior approval by the Town Architect or the ARC.

(i) Decks. Decks must be located at the rear of Units and must be approved by the Town Architect or the ARC. The configuration, detail and railing design of a deck should be harmonious with the architectural style of the Unit.

(j) Drainage. Catch basins and drainage areas are for the purpose of natural flow of water only. No obstructions or debris shall be placed in these areas. No Person, other than

Declarant, the Club or the Association, may obstruct or rechannel the drainage flows after location and installation of drainage swales, storm sewers, or storm drains. Declarant hereby reserves for itself, the Club and the Association a perpetual easement across the Property for the purpose of altering drainage and water flow.

(k) Dumping. No Person may dump grass clippings, leaves or other debris, petroleum products, fertilizers or other potentially hazardous or toxic substances anywhere on the Property, except that fertilizers may be applied to landscaping on Lots provided care is taken to minimize runoff.

(l) Energy Conservation Equipment. No solar energy collector panels or attendant hardware or other energy conservation equipment shall be constructed or installed on any Lot or Unit unless it is an integral and harmonious part of the architectural design of the Lot or Unit, as determined in the sole discretion of the Town Architect or the ARC. Under no circumstances shall solar panels be installed so as to be visible from any Lot, Units, or street in the Community or from any portion of the Club Property.

(m) Firearms. The discharge of firearms within the Property is prohibited. The term "firearms" includes "B-B" guns, pellet guns, and other firearms of all types, regardless of size. Notwithstanding anything to the contrary contained herein or in the Articles, the Association shall not be obligated to take action to enforce this Section.

(n) Golf Carts. No private golf carts will be permitted within the Community, except as permitted by the Association in accordance with the Rules and Regulations. The Association and/or the Club shall be entitled to establish and charge a uniform reasonable fee for its inspection and approval of golf carts. Such fee shall be separate from, and in addition to, any trail or license fee charged in connection with the use of any golf cart on the golf course. All such golf carts shall be painted a color approved by the Club. Golf carts shall be confined to designated paths within the Common Area and the use of such paths shall be entirely at the user's own risk and shall be licensed by the appropriate governmental authority to the extent required. Care shall be taken by golf cart users to avoid injury to pedestrians who shall enjoy the right of way on such paths.

(o) Irrigation. No sprinkler or irrigation systems of any type which draw from any body of water within the Property shall be installed, constructed or operated by any Person, other than the Association, Declarant or the Club, without the prior written approval of the Town Architect or the ARC.

(p) Lighting. Each Sub-developer may be required to install on any Lot or Units constructed by such Sub-developer exterior lighting as determined by the Town Architect or the ARC. Lots or Owners of the Lots or Units served by such lighting will be responsible for maintaining the lighting and the Association shall have the right, at Owner's cost and expense, to maintain such lighting in the event Owner fails to do so. All exterior lighting must be approved by the Town Architect or the ARC prior to installation, except for reasonable seasonal decorative lights which may be displayed between November 15 and January 10 only.

(q) Mailboxes and Exterior Hardware. The style and design of all mailboxes, lettering and numbering, and exterior hardware must be in accordance with the Design Guidelines.

(r) Maintenance of Lots.

(1) Landscaping. No weeds, underbrush, or other unsightly growth shall be permitted to grow or remain upon any Lot, and no refuse or unsightly objects shall be allowed to be placed or suffered to remain upon any Lot. All landscaping, sprinkler systems and any property, structure, improvement and appurtenance shall be kept in good, safe, clean, neat and attractive condition.

(2) Painting. The exterior of all Units shall have a fresh coat of paint, applied evenly and no excessive cracks, peelings, or stripping shall be allowed to remain unremedied.

(3) Roofing. The roofs of all Units shall be maintained in a clean, neat and attractive condition with a full complement of roof tiles or shingles. Upon the failure to maintain the premises as aforesaid to the satisfaction of the Association, the Association may, but shall not be required to, enter upon such premises and make such improvements or corrections as may be necessary, the costs of which along with an administrative surcharge of ten percent (10%) of such amount shall be assessed against the affected Owner(s) as an assessment in accordance with Article X hereof.

(s) Manufactured Homes. Manufactured homes, modular homes and prefabricated homes shall not be permitted in the Community except as otherwise specifically permitted by Declarant or the Town Architect or the ARC.

(t) Nuisance. No portion of the Property shall be used, in whole or in part, for the storage of any property or thing that will cause it to appear to be in an unclean or untidy condition or that will be obnoxious to the eye, nor shall any substance, thing, or material be kept upon any portion of the Property that will emit foul or obnoxious odors or that will cause any noise or other condition that will or might disturb the peace, quiet, safety, comfort, or serenity of the occupants of surrounding Units. No activity shall be conducted nor shall there be maintained any animal, plant, device or thing of any sort on the Property which is in any way noxious, dangerous, illegal, offensive, unsightly, unpleasant or of a nature that could diminish or destroy any portion of the Property.

(u) Occupants Bound. All provisions of the Governing Documents which govern the conduct of Owners and which provide for sanctions against Owners shall also apply to all occupants, guests and invitees of any Unit. Every Owner shall cause all occupants of his or her Unit to comply with Governing Documents and shall be responsible for all violations and losses to the Common Area caused by such occupants, notwithstanding the fact that such occupants of a Unit are fully liable and may be sanctioned for any violation of the Governing Documents.

(v) On-Site Fuel Storage. No on-site storage of gasoline or other fuels in excess of five (5) gallons for operation of lawn maintenance and similar equipment and/or emergency purposes shall be permitted on any part of the Property.

(w) Parking. Vehicles shall be parked only in the garages or in the driveways, if any, serving the Units or in appropriate spaces or designated areas in which parking may or may not be assigned. Notwithstanding the above, no more than two (2) vehicles shall be parked in the driveway serving any Unit on a regular basis. For purposes of this paragraph, a car shall be deemed parked on a "regular basis" if parked in such driveway continuously for more than seventy-two (72) hours in any seven (7) day period without prior approval of the Board of Directors. Garage doors shall remain closed at all times except during ingress and egress. Any vehicle which is parked in violation of this paragraph or parking rules promulgated by the Board may be towed in accordance with the Rules and Regulations. Notwithstanding the foregoing, service and delivery vehicles may be parked in the driveway of a Unit during daylight hours for such period of time as is reasonably necessary to provide service or make a delivery to the Unit.

(x) Playground, Play Equipment, Strollers. All bicycles, tricycles, scooters, skateboards, and other play equipment, wading pools, baby strollers and similar items shall be stored so as not to be visible from streets or property adjacent to the Unit. No such items shall be allowed to remain in the open so as to be visible from adjacent property when not in use. Notwithstanding the above, the Board of Directors may, but shall not be obligated, to permit swing sets and similar permanent playground equipment to be erected within the Community provided they are pre-approved by the Town Architect or the ARC. Any playground or other play areas or equipment furnished by the Association or erected within the Community shall be used at the risk of the user, and the Association shall not be held liable to any Person for any claim, damage, or injury occurring thereon or related to the use thereof.

(y) Pools. No above-ground pools shall be erected, constructed or installed on any Lots, except that above ground spas and jacuzzis may be permitted as approved by the Town Architect or the ARC.

(z) Prohibited Vehicles. Commercial vehicles, vehicles with commercial writing on their exteriors, vehicles primarily used or designed for commercial purposes, pick-up trucks, tractors, mobile homes, recreational vehicles, trailers (either with or without wheels), campers, camper trailers, boats and other watercraft, and boat trailers shall be parked only in enclosed garages or in the common parking area, if any, designated by the Association. Stored vehicles and vehicles which are either obviously inoperable or do not have current operating licenses shall not be permitted within the Community, except within enclosed garages. For purposes hereof, a vehicle shall be considered "stored" if it is put up on blocks or covered with a tarpaulin and remains on blocks or so covered for fourteen (14) consecutive days without the prior approval of the Board of Directors. Notwithstanding the foregoing, service and delivery vehicles may be parked in the driveway of a Lot during daylight hours for such period of time as is reasonably necessary to provide service or make a delivery to a Lot. Any vehicle which is parked in violation of this paragraph may be towed by the Board of Directors at the Owner's expense. This paragraph shall not apply to any commercial vehicles providing service or making deliveries to or on behalf of the Association, Declarant or their designees.

(aa) Roadways, Sidewalks, Driveways. All utilities within the Property shall be installed underground, unless otherwise specifically pre-approved by Declarant or the Town Architect or the ARC. Utility lines, including without limitation cable television and gas, may only be installed, repaired or replaced under existing roadways, sidewalks and driveways by a method which will not disturb the paved surface of such roadway, sidewalk or driveway. This restriction is intended to preserve the aesthetic nature of the paved surfaces.

(bb) Sight Distance at Intersections. All Lots located at street intersections shall be maintained so as to permit safe sight across the street corners. No fence, wall, hedge, or shrub planting shall be placed or permitted to remain where it would create a traffic or sight problem.

(cc) Signs and Flagpoles. No sign (including "for sale" signs), billboard or advertisement shall be erected except as otherwise specifically pre-approved by the Town Architect or the ARC. Declarant and the Board of Directors shall have the right to erect signs as they deem appropriate, in their discretion.

(dd) Subdivision of Unit and Timesharing. No Lot shall be subdivided or its boundary lines changed except by Declarant prior to the Turnover Date or with the prior written approval of the Board of Directors of the Association after the Turnover Date. No Unit shall be made subject to any type of timeshare program, interval ownership or similar program whereby the right to exclusive use of the Unit rotates among multiple owners or members of the program on a fixed or floating time schedule over a period of years, except that Declarant hereby reserves the right for itself and its assigns or a Person designated by Declarant for such purposes to operate such a program with respect to Units which the party in question owns.

(ee) Tents, Trailers and Temporary Structures. Except as may be permitted by the Town Architect or the ARC during initial construction within the Community, Owners or occupants shall not place or allow to be placed any tent, utility shed, shack, trailer or other structure of a temporary nature within the Community.

(ff) Tree Removal. No trees, other than for safety reasons, shall be removed unless pre-approved by the Town Architect or the ARC. Any stumps resulting from trees being damaged by acts of God must be removed.

(gg) Walls and Fencing. Walls and fencing on a Lot shall not be permitted unless pre-approved by the Town Architect or the ARC

(hh) Wells. No private wells are permitted on any Lot.

(ii) Wetlands, Lakes and Water Bodies. All wetlands, lakes, ponds, and streams within the Property, if any, shall be storm water retention facilities or aesthetic amenities only, and no other use thereof, including, without limitation, fishing, swimming, boating, playing, or use of personal flotation devices, shall be permitted. No docks, piers, or other structures shall be constructed on or over any body of water within the Property.. The elevation of the land shall not be altered and fill shall not be used to extend the boundaries of a Lot or to change the bulkhead line on any Lot bounded by a wetland, lake, or other body of water.

(jj) Window Coverings. All windows on any structure which are visible from the street or dwellings on other Units shall have window coverings which have a white or off-white backing or blend with the exterior color of the dwelling, unless otherwise pre-approved by the Town Architect or the ARC after application pursuant to Article VI hereof. Reflective window coverings are prohibited.

6.2 Leasing of Units

(a) Definition. "Leasing", for purposes of this Master Declaration, is defined as regular, exclusive occupancy of a Unit by any person or persons other than the Owner for which the Owner receives any consideration or benefit, including, but not limited to a fee, service, gratuity, or payment of any kind.

(b) Leasing Provisions. Units may be rented only in their entirety; no fraction or portion may be rented. There shall be no Leasing of Units or assignment of Leases unless prior written approval is obtained from the Association. All leases shall be in writing in a form approved by the Association. The Association may charge each Owner an administrative fee for reviewing and approving proposed leases and performing background checks against the proposed lessee. The Owner must make available to the lessee copies of the Governing Documents. The Association reserves the right to approve lessees and establish a minimum term of all leases. All leases shall require that the tenant acknowledge receipt of the Governing Documents and provide that, in the event of non-compliance, the Board may, in addition to other remedies available to it, evict the tenant on behalf of the Owner and specifically assess all costs associated therewith against the tenant. This paragraph shall not apply to leasing by Declarant or its successors, assigns or affiliates. Lessees ability to access Club Property and use any of the Club's facilities shall be subject to and governed by the Club Membership Plan Documents.

6.3 Compliance with the Governing Documents

Every Owner shall cause all occupants of his or her Unit to comply with the Governing Documents and the Neighborhood Governing Documents (if applicable), and shall be responsible for all violations and losses to Common Area caused by such occupants, notwithstanding the fact that such occupants of a Unit are fully liable and may be sanctioned for any violation of the Governing Documents and the Neighborhood Governing Documents (if applicable).

6.4 Exculpations and Approvals

Declarant, the Association, the Town Architect or the ARC, the Club, the Albany Yacht Club and any of their agents may grant, withhold or deny their consent, permission or approval in any instance when their consent, permission or approval is permitted or required at their sole discretion and without any liability of any nature or kind to any Owner or any other Person for any reason whatsoever and shall be indemnified and held harmless by such Owner or other Person from any and all damages resulting therefrom, including, but not limited to, court costs and reasonable attorneys' fees. Every consent, permission or approval by Declarant, the Association, the Town Architect or the ARC, the Club, the Albany Yacht Club or any of their agents under this Master Declaration shall be in writing and binding upon all Persons.

6.5 Community-Wide Standards, Rules and Regulations

Declarant shall establish the initial Community-Wide Standards and may from time to time modify, alter, amend, rescind and augment the same during such period in which Declarant owns any portion of the Property or Additional Property and thereafter such right shall be reserved to the Association. The Association, through the Board, shall have the right to promulgate and impose further Community-Wide Standards or any Rules and Regulations of the Association and thereafter to modify, alter, amend, rescind and augment any of the same with respect to the use, operation and enjoyment of all or a portion of the Property, the Common Area, the Exclusive Common Area and any improvements located thereon including, but not limited to, establishing reasonable fees for the use of facilities and establishing hours and manner of operation; provided that, Declarant's written consent shall be required during any period in which Declarant owns any portion of the Property or Additional Property.

6.6 NOTICE TO PURCHASERS AND OWNERS ACKNOWLEDGEMENT

All Owners and occupants of Units are given notice that use of their Units is limited by this Master Declaration, the rules and regulations, as the same may be in effect from time to time and any Supplemental Declarations. Each Owner, by acceptance of a deed, acknowledges and agrees that the use and enjoyment and marketability of his or her Unit can be affected by this provision and that the Master Declaration and Rules and Regulations may change from time to time. Copies of the current Rules and Regulations may be obtained from the Association.

ARTICLE VII
ARCHITECTURAL STANDARDS AND REVIEW

7.1 IN GENERAL

All construction improvements and modifications to any Unit shall comply with the Master Plan, the Design Guidelines, the applicable building regulations and standards established by the applicable governmental authority from time to time as well as the terms and conditions set forth in this Master Declaration. EACH OWNER AND SUB-DEVELOPER ACKNOWLEDGES THAT PRIOR TO SUBMITTING AN APPLICATION TO THE RESPECTIVE GOVERNMENT AUTHORITY FOR A BUILDING PERMIT FOR ANY CONSTRUCTION OR IMPROVEMENT, THE PLANS FOR SUCH CONSTRUCTION OR IMPROVEMENT SHALL BE SUBJECT TO THE REVIEW AND PRE-APPROVAL OF DECLARANT IN ACCORDANCE WITH THE DESIGN GUIDELINES.

Such plans shall include plans and specifications showing i) site layout ii) structural design iii) exterior elevations iv) exterior materials and v) colour schemes relating to any buildings, roofing, pools, driveways, landscaping and or other features of proposed construction, improvement and or installation intended on such Lot, as applicable, together with the proposed site on the Lot and materials intended in the installation and construction of the necessary parking spaces. Declarant shall have the right to call for such additional information and/or the submission of sample materials and sample colours from an Owner in its discretion in order to complete its review.

7.2 ARCHITECTURAL STANDARDS

No construction (which term shall include, without limitation, staking, clearing, excavating, grading, and other site work), no exterior alteration, improvement or modification of existing improvements, and no plantings or removal of plants, trees, or shrubs shall take place except in strict compliance with this Article, until the requirements below have been fully met, and until the approval of Declarant has been obtained pursuant to this Article. Declarant may establish reasonable fees to be charged for the review of an application for approval hereunder, which fees, if established, shall be paid in full prior to review of any application hereunder. All structures constructed on any portion of the Property shall be designed and built in accordance with the approved plans and specifications.

Declarant, in its sole discretion, may delegate all or a portion of its rights reserved under this Article to the Town Architect or Architectural Review Committee appointed by Declarant and subject the exercise of such rights by Town Architect or the ARC to the written consent of Declarant so long as Declarant owns any portion of the Property or the Additional Property. Any rights and/or actions set forth in this Article which shall refer to the Town Architect or the ARC having such rights and taking such actions shall only apply to such person or persons in the event Declarant delegates the same to the Town Architect or the ARC. If, however, this Article refers to the Town Architect or the ARC having such rights and taking such actions and Declarant does not delegate such right or action to the Town Architect or the ARC, the reference in this Article to the Town Architect or the ARC having such rights and taking such actions shall mean Declarant having such rights and taking such actions.

Upon Declarant's delegation to the Town Architect or the ARC, the Town Architect or the ARC shall have exclusive jurisdiction to review and approve all construction on any portion of the Property. At such time as Declarant no longer owns any portion of the Property or the Additional Property, the Board of Directors shall have the right to appoint the Town Architect or the members of the ARC. There is no requirement that the Town Architect or members of the ARC be members or representatives of Members of the Association.

Following the above-referenced delegation, the Town Architect or the ARC shall prepare and promulgate Design Guidelines on behalf of the Board of Directors. As a result of such delegation, the Town Architect or the ARC shall have sole and full authority to amend the Design Guidelines in its sole discretion. Copies of current Design Guidelines shall be available from the Town Architect or the ARC to Owners and Sub-developers who seek to engage in development of or construction upon all or any portion of the Property, and such Owners and Sub-developers shall conduct their operations strictly in accordance therewith. In the event that the Town Architect or ARC fails to approve or disapprove plans submitted to it, or to request additional information reasonably required within sixty (60) days after receipt by the Town Architect or the ARC thereof in accordance with the notice provisions of this Article VII herein, the plans shall be deemed approved.

This Article shall not apply to any construction on or improvements or modifications to the Common Area made by or on behalf of the Association or to the activities of Declarant or the maintenance and repair of the exterior of a Unit (i.e. repainting of the exterior with the originally approved colour scheme) in accordance with the originally approved plans and specifications or the decoration, redecoration or modification of the interior of a Unit. The Board of Directors shall have the authority and standing, on behalf of the Association, to enforce in courts of competent jurisdiction decisions of the Town Architect or the Architectural Review Committee established in this Article VII. This Article may not be amended without Declarant's prior written consent so long as Declarant owns any portion of the Property or the Additional Property.

7.3 No Waiver of Future Approvals

Each Owner acknowledges that the persons reviewing applications under this Article will change from time to time and that opinions on aesthetics matters, as well as interpretation and application of the Design Guidelines, may vary accordingly. In addition, each Owner acknowledges that it may not always be possible to identify objectionable features until work is completed, in which case it may be unreasonable to require changes to the improvements involved, but the Town Architect or the ARC may refuse to approve similar proposals in the future. Approval of applications or plans, or in connection with any other matter requiring approval, shall not be deemed to constitute a waiver of the right to withhold approval as to any similar applications, plans, or other matters subsequently or additionally submitted for approval.

The approval of the Town Architect or the ARC of any proposals or plans and specifications or drawings for any work done or proposed, or in connection with any other matter requiring the approval and consent of such committee, shall not be deemed to constitute a waiver of any right to withhold approval or consent as to any similar proposals, plans and specifications, drawings, or other matters whatsoever subsequently or additionally submitted for approval or consent.

7.4 Exceptions

The Town Architect or the ARC may authorize exceptions from compliance with any of its guidelines and procedures when circumstances such as topography, natural obstructions, hardship, or aesthetic or environmental considerations require. Such exceptions may only be granted, however, when unique circumstances dictate and no exception shall be effective unless it is reduced to writing. No exception shall estop the Town Architect or the ARC from denying an exception in other circumstances. For purposes of this Section, the inability to obtain approval of any governmental agency, the issuance of any permit, or the terms of any financing shall not be considered a hardship warranting an exception.

7.5 No Liability

No review or approval by the Town Architect or the ARC shall imply or be deemed to constitute an opinion by the Town Architect or the ARC, nor impose upon the Town Architect or the ARC, the Association, Declarant or any other party, any liability for the design or construction of building elements, including, but not limited to, structural integrity or life and safety requirements. The scope of any such review and approval by the Town Architect or the ARC is limited solely to whether the respective plans or work meet certain requirements, standards, and guidelines relating to aesthetics and the harmony and compatibility of proposed improvements in the Community. No review or approval will be for any other Person or purpose, and no Person other than the Town Architect or the ARC shall have any right to rely thereon, and any review or approval by the Town Architect or the ARC will create no liability whatsoever of the Town Architect or the ARC, Declarant or the Association to any other Person or party whatsoever.

Each Person who submits plans or specifications and every Owner agrees that such Person or Owner will not bring any action or suit against the Town Architect or the ARC, the Association, Declarant or any other party, to recover any damages and hereby releases, remises, quit claims, and covenants not to sue for all claims, demands, and causes of actions arising out of or in connection with this Article VII and hereby waives the provisions of any law which provides that a general release does not extend to claims, demands, and causes of action not known at the time the release is given.

7.6 COMPLIANCE

Any Owner or contractor, subcontractor, agent or employee of an Owner or Sub-developer who fails to comply with the terms and provisions of the Design Guidelines and procedures promulgated by the Town Architect or the ARC may be fined and/or excluded by the Board of Directors from the Property without liability to any Person, subject to the notice and hearing procedures contained in the Articles, and any improvements constructed in violation of this Article may be razed by the Association without payment or liability to any Person.

7.7 RIGHTS OF THE CLUB

The Club shall be given fifteen (15) days prior written notice of all meetings of the Town Architect or the ARC wherein the construction or improvement under consideration (or any portion thereof) is contiguous to the Club Property or in the direct line of sight from the Club for the depth of one (1) Lot. If in the reasonable opinion of the Club the construction or modification being reviewed has a material adverse impact on the golf course whether by restriction of view, hazards to person or otherwise, then, in that event, the Club may disapprove the proposed construction irrespective of the approval of same by the Town Architect or the ARC and the Owner shall resubmit to the Town Architect or the ARC the proposed construction or modification so as to take into account the objection of the Club, which shall be given in writing to the Owner by the Town Architect or the ARC. This provision may not be amended without the prior written consent of Declarant and the Club or the prior written consent of only the Club where Declarant no longer owns any portion of the Property or the Additional Property.

7.8 RIGHTS OF ALBANY YACHT CLUB

Albany Yacht Club shall be given fifteen (15) days prior written notice of all meetings of the Town Architect or the ARC wherein the construction or improvement under consideration (or any portion thereof) is contiguous to the Marina Property or in the direct line of sight from Albany Yacht Club for the depth of one (1) Lot. If in the reasonable opinion of Albany Yacht Club the construction or modification being reviewed has a material adverse impact on the Marina Property whether by restriction of view, hazards to person or otherwise, then, in that event, Albany Yacht Club may disapprove the proposed construction irrespective of the approval of same by the Town Architect or the ARC and the Owner shall resubmit to the Town Architect or the ARC the proposed construction or modification so as to take into account the objection of Albany Yacht Club, which shall be given in writing to the Owner by the Town Architect or the ARC. This provision may not be amended without the prior written consent of Declarant and Albany Yacht Club or the prior written consent of only Albany Yacht Club where Declarant no longer owns any portion of the Property or the Additional Property.

ARTICLE VIII
NEIGHBORHOODS; NEIGHBORHOOD ASSOCIATIONS

8.1 NEIGHBORHOODS

A parcel of land intended for development as a residential area may constitute a Neighborhood, subject to further division into more than one (1) Neighborhood upon further development. Declarant may designate Neighborhoods by Supplemental Declarations. The Lots within a particular Neighborhood may be subject to additional covenants and/or the Owners may be members of a Neighborhood Association in addition to the Association, but there shall be no requirement to establish a Neighborhood Association except in the case of a condominium or as otherwise required by law. Each Neighborhood, upon the affirmative vote, or written consent, or a combination thereof, of a majority of Owners within the Neighborhood, may request that the Association provide a higher level of service or special services for the benefit of Lots in such Neighborhood, the cost of which shall be assessed against the benefited Lots as a Neighborhood Assessment. The Association may, but it is not required to, provide such higher level of services.

8.2 EXCLUSIVE COMMON AREA

(a) Neighborhood Expense. All costs and expenses of the Exclusive Common Area shall be borne by the Owners of Lots located in the Neighborhood(s) benefited by such Exclusive Common Area, as set forth in a Supplemental Declaration, a Neighborhood Declaration, or other document.

(b) Operation of Neighborhood Association. A Neighborhood Association shall have the right, subject to Declarant's prior consent if prior to the Turnover Date to contract with the Association to provide for the operation and maintenance of its Exclusive Common Area.

8.3 CERTAIN RIGHTS OF DECLARANT REGARDING NEIGHBORHOOD ASSOCIATIONS

Declarant hereby reserves the right, and the power, but neither the duty nor the obligation, without the consent of any other Person:

(a) to determine consistency of any Neighborhood Governing Documents with this Master Declaration, and approve and consent to any Neighborhood Governing Documents and any amendments thereto prior to their recordation. Neighborhood Governing Documents shall not be effective until Declarant approves and consents to them in writing and the Neighborhood Governing Documents are recorded (where applicable);

(b) to require that specific provisions be included in Neighborhood Governing Documents as Declarant reasonably deems appropriate, including, without limitation, any provisions required to render such Neighborhood Governing Documents consistent with this Master Declaration;

(c) to require that the fiscal year of any Neighborhood Association be the same as that of the Association;

(d) to require that the Association approve the budget of any Neighborhood Association prior to the approval by the Neighborhood Association;

(e) to create additional Neighborhood Associations for the operation, administration and maintenance of any Neighborhood, or groups of Neighborhoods; and

(f) to approve or disapprove the merger of any two or more Neighborhood Associations.

8.4 CERTAIN RIGHTS OF ASSOCIATION REGARDING NEIGHBORHOOD ASSOCIATIONS

(a) Enforcement. If any Neighborhood Association fails to comply with this Master Declaration or any of the other Governing Documents or any Neighborhood Governing Documents, the Association shall have the right and power, but neither the duty nor the obligation, to enforce the provisions of this Master Declaration or the Neighborhood Governing Documents, or to perform the Neighborhood Association's duties and responsibilities, or to seek judicial relief or remedy to require compliance with same, and to obtain payment of the cost of such performance or enforcement, plus a reasonable administrative charge equal to ten percent (10%) of such amount.

(b) Special Assessments. The Association shall have the right, in addition to any other rights of the Association, to specially assess the members of a Neighborhood Association and such Neighborhood Association for expenses incurred by the Association for such Neighborhood Association.

(c) Collection of Assessments. Upon request by the Association, each separate Neighborhood Association shall collect from each Owner (other than Declarant) the Common Assessments for the Association for each Lot within the Neighborhood and shall promptly remit such amounts to the Association. In the event that any Owner shall fail to pay to the Neighborhood Association his or her Common Assessments as levied by the Association, the Association shall have the right to collect such Assessments directly from such Owner.

(d) Entry Rights. The Association shall have the right, for itself, its designee, or any agent or employee, to enter upon any property administered by a Neighborhood Association to carry out the provisions of the Governing Documents or the applicable Neighborhood Governing Documents, and the same shall not constitute a trespass.

(e) Delegation. The Association shall have the right and power, but neither the duty nor the obligation, to assign in whole or in part, exclusively or non-exclusively, and on a permanent or temporary basis, to any Neighborhood Association any obligation of maintenance or repair created under this Master Declaration or by assignment from Declarant. If a Neighborhood Association does not accept such rights and obligations in a manner consistent with the standards established by the Association, then the Association shall have the right, but not the obligation, by its sole act, to terminate such assignment, and again fulfill such rights and obligations.

(f) Right to Maintain Exclusive Common Area. The Association shall have the right to maintain the Exclusive Common Area of a Neighborhood, including in particular, all landscaping within the Neighborhood, and may assess the cost of such maintenance as a Neighborhood Expense.

(g) Priority. When Neighborhood Governing Documents are in conflict with the Governing Documents, the latter shall prevail.

ARTICLE IX
MEMBERSHIP AND VOTING RIGHTS

9.1 CLASSES OF MEMBERSHIP AND VOTING RIGHTS

There shall be three (3) classes of membership in the Association as follows:

(a) Class "A" Membership. Each Owner of a Lot, other than Declarant, shall be a Class "A" Member. Each Class "A" Member shall be entitled to one (1) vote for each Lot owned.

(b) Class "B" Membership. Declarant shall be a Class "B" Member until the Turnover Date unless Declarant shall sooner terminate its Class "B" Membership, after which time Declarant shall be a Class "A" Member. The Class "B" Member shall be entitled to five (5) votes for each Lot owned by Declarant. After Declarant is converted to a Class "A" Member, it shall be entitled to one (1) vote for each Lot it owns. The Class "B" Member shall be entitled to appoint all of the members of the Board of Directors until the Turnover Date as specified in the Articles.

(c) Class "C" Membership. The Club shall be a Class "C" Member. The Class "C" Member shall be entitled to one hundred (100) votes. Additionally,, the Class "C" Member shall be entitled to appoint one member of the Board of Directors after the Turnover Date.

(d) Class "D" Membership. The Albany Yacht Club shall be a Class "D" Member. The Class "D" Member shall be entitled to one hundred (100) votes. Additionally, the Class "D" Member shall be entitled to appoint one member of the Board of Directors after the Turnover Date.

9.2 JOINT OWNERSHIP

This Article 9.2 shall only apply to those matters which this Master Declaration or the Articles specifically state shall be voted upon by a Member or an Owner. Voting rights may be exercised by a Member or the Member's spouse. In any situation where more than one Person holds an interest in a Lot, the vote for that Lot shall be exercised by any such Person; provided, however, the Persons holding the interest in the Lot can notify the Secretary of the Association, in writing, prior to or during any meeting of the manner in which the vote for the Lot is to be exercised and, in the absence of such notice, the Member's vote shall be suspended if more than one (1) Person seeks to exercise it. The voting rights of a Member that is a company or other form of entity ownership shall be exercised by the individual designated from time to time by the Owner in a written instrument provided to the Secretary.

9.3 TURNOVER DATE

The date on which the earlier of the following shall occur (i) 60 days after Declarant no longer owns any portion of the Property or the Additional Property (excluding Declarant's Retained Land) or (ii) such earlier date, as determined in Declarant's sole and absolute discretion, that Declarant converts its Class "B" Membership into Class "A" Membership.

9.4 THE CLUB'S APPROVAL RIGHTS

The Club shall have the right to disapprove actions of the Board and any committees which in its reasonable judgment materially and adversely affect the use of the Club Property or its rights or obligations under this Master Declaration. This right may be exercised by the Club at any time within ten (10) days after the Club's receipt of the notice of such proposed action. This provision may not be amended without the prior written consent of the Club. The Club shall also have a right to receive copies of all notices of meetings and minutes of the meetings of the Members and the Board of Directors or any written consents of the Members or the Board of Directors in lieu of a meeting.

9.5 ALBANY YACHT CLUB'S APPROVAL RIGHTS

Albany Yacht Club shall have the right to disapprove actions of the Board and any committees which in its reasonable judgment materially and adversely affect the use of the Marina Property or its rights or obligations under this Master Declaration. This right may be exercised by Albany Yacht Club at any time within ten (10) days after Albany Yacht Club's receipt of the notice of such proposed action. This provision may not be amended without the prior written consent of Albany Yacht Club. Albany Yacht Club shall also have a right to receive copies of all notices of meetings and minutes of the meetings of the Members and the Board of Directors or any written consents of the Members or the Board of Directors in lieu of a meeting.

ARTICLE X
ASSESSMENTS

10.1 AFFIRMATIVE COVENANT TO PAY ASSESSMENTS

There is hereby imposed upon each Owner and each Lot, the affirmative covenant and obligation to pay to the Association all Assessments in respect of the Lot. Each Owner, by acceptance of a deed or other instrument conveying title to a Lot, whether or not it is so expressed in such deed or instrument, shall be obligated and agrees to pay all Assessments, regardless of their nature, including, but not limited to, any then past due Assessments in accordance with the provisions of this Master Declaration and consents and agrees that the Association may encumber the Lot with a charge in respect of any such past due Assessments. The liability for Assessments is personal to the Owner and may not be avoided by waiver of the use or enjoyment of Common Area or Exclusive Common Area, or by abandonment of the Lot for which the Assessments are made. Neither the liability for Assessments, nor the amount of Assessments, shall be reduced or avoided due to the fact that all or any portions of the Common Area, Exclusive Common Area or other portions of the Property are not completed. No diminution or abatement of assessment or set-off shall be claimed or allowed by reason of any alleged failure of the Association or the Board of Directors to take some action or perform some function required to be taken or performed by the Association or the Board of Directors under this Master Declaration, the Memorandum, or the Articles or for inconvenience or discomfort arising from the making of repairs or improvements, or from any action taken to comply with any law or with any order or directive of any municipal or other governmental authority.

10.2 CREATION OF ASSESSMENTS

There are hereby created Assessments for expenses of the Association as the Board of Directors may authorize from time to time to be commenced at the time and in the manner set forth herein. There shall be three (3) types of Assessments:

(a) Common Assessments. Common Assessments shall be levied equally on all Lots.

(b) Neighborhood Assessments. Neighborhood Assessments shall be levied equally on all Lots within the Neighborhood for whose benefit Neighborhood Expenses are incurred as provided in Section 10.5; and

(c) Special Assessments. Special Assessments shall be levied as provided in Section10.6 below.

10.3 PAYMENT OF ASSESSMENTS

Assessments shall be paid in such manner and on such dates as may be fixed by the Board of Directors, which may include, without limitation, an acceleration of the annual Common Assessment and any Neighborhood Assessment for delinquent payments. Unless the Board of Directors provides otherwise, the Common Assessment and any Neighborhood Assessment shall be paid in advance on a quarterly basis. The Association shall, upon demand at any time, furnish to any Owner liable for any type of Assessment a certificate, in writing, signed by an officer of the Association, setting forth whether such Assessment has been paid in respect of any particular Lot. Such certificate shall be conclusive evidence that the Assessment stated therein has been paid to the Association. The Association may require the advance payment of a reasonable processing fee for the issuance of such certificate.

10.4 COMPUTATION OF COMMON ASSESSMENT

It shall be the duty of the Board of Directors to prepare a budget annually that shall reflect the estimated revenues and Common Expenses of the Association for the ensuing fiscal year including fees and charges for use of Common Area charged by the Association, if any; the estimated surplus or deficit; and the estimated funds necessary to maintain the accounts established by the Board of Directors (including any capital replacement reserve provided for in the Association's budget). The Common Assessment levied against each Lot which is subject to the Common Assessment shall be computed by dividing the budgeted Common Expenses by the total number of Lots which are subject to Common Assessments plus the total number of Lots reasonably anticipated to become subject to Common Assessments during the fiscal year. The budget and the amount of the Common Assessment shall be determined by the Board of Directors, in their sole and absolute discretion.

The Board of Directors shall cause a copy of the Common Expense budget and notice of the amount of the Common Assessment to be levied for the following year to be delivered to each Owner at least thirty (30) days prior to the beginning of the fiscal year. The budget adopted by the Board shall become effective automatically. Notwithstanding the foregoing, in the event the Board fails for any reason to determine the budget for any year, then and until such time as a budget shall have been determined as provided herein, the budget in effect for the immediately preceding year shall continue; provided, however, that upon the adoption of a new budget, the same shall be deemed retroactive to the beginning of the then current budget year and each Owner shall pay the increase, if any, in the Common Assessment for the beginning of such year at the time the next installment is due.

10.5 Computation of Neighborhood Assessments

It shall be the duty of the Board of Directors annually to prepare a separate budget reflecting the estimated Neighborhood Expenses to be incurred by the Association for each Neighborhood on whose behalf Neighborhood Expenses are expected to be incurred for the ensuing fiscal year. The Board of Directors shall be entitled to set such budget in its sole and absolute discretion limited only to the extent that this Master Declaration or a Supplemental Declaration specifically authorizes the Board of Directors to assess certain costs as a Neighborhood Assessment. Any Neighborhood may request that additional services or a higher level of services be provided by the Association, and in such case, any additional costs shall be added to the Neighborhood's budget. This budget may include a capital contribution establishing a reserve fund for repair and replacement of capital items within the Neighborhood, as appropriate. The Neighborhood Assessment levied against each Lot in that Neighborhood which is subject to the Neighborhood Assessment shall be computed by dividing the budgeted Neighborhood Expenses for that Neighborhood by the total number of Lots within such Neighborhood which are subject to the Neighborhood Assessments plus the total number of Lots in that Neighborhood reasonably anticipated to become subject to the Neighborhood Assessments during the fiscal year. The Board of Directors shall cause a copy of such budget and notice of the amount of the Neighborhood Assessment to be levied on each Lot for the coming year to be delivered to each Owner of a Lot in the benefited Neighborhood at least thirty (30) days prior to the beginning of the fiscal year. The budget shall become effective automatically. In the event the Board of Directors fails for any reason to determine the budget for any year, then and until such time as a budget shall have been determined as provided herein, the budget in effect for the immediately preceding year shall continue.

10.6 Special Assessments

(a) As To All Members. The Board of Directors, upon the affirmative vote of a majority of votes cast by the Class "A" Members of the Association and the consent of the Class "B" Member so long as the Class "B" Membership exists, may levy Special Assessments for unbudgeted expenses or expenses in excess of those budgeted for, including but not limited to, capital improvements and repairs. However, no membership vote shall be required for Special Assessments due to budget shortfalls in any year, as a result of an emergency to protect, preserve or repair the Common Area from any casualty or threat thereof or as otherwise provided in subsection (b) hereof. Special Assessments pursuant to this paragraph shall be payable in such manner and at such times as determined by the Board of Directors, and may, if the Board of

Directors so determines, be payable in installments extending beyond the fiscal year in which the Special Assessment is approved.

(b) Less Than All Members. Without a membership vote, the Association may levy a Special Assessment against any Member individually and against such Member's Lot to reimburse the Association for costs incurred in bringing a Member and the Lot or Unit into compliance with the provisions of the Governing Documents which Special Assessment may be levied upon the vote of the Board of Directors after notice to the Member and an opportunity for a hearing. Further, Special Assessments may be levied to cover the costs, including overhead and administrative costs of providing services to Units upon request of an Owner pursuant to a menu of special services that may be offered by the Association without any vote of the Board. Such Special Assessments may be levied in advance of the provision of the requested service. The Association may also levy, without a membership vote, a Special Assessment against the Lots in any Neighborhood to reimburse the Association for costs incurred in bringing the Neighborhood into compliance with the provisions of the Governing Documents, which Special Assessment may be levied upon the vote of the Board of Directors after notice to the Members from such Neighborhood and an opportunity for a hearing. In the event the Association enters into a bulk rate cable television agreement for the Community, the Association may assess all Lots for which a certificate of occupancy has been issued for cable television service, without a vote of the members. For any Special Assessment levied for failure to comply with the Governing Documents, the Association may add an administration charge equal to ten (10%) percent of such amount.

10.7 DECLARANT'S OBLIGATION FOR ASSESSMENTS

Beginning on the date of the recordation hereof, and continuing so long as Declarant owns one or more Lots, Declarant shall pay the difference, if any, between the amount of Assessments payable by Owners other than Declarant and the actual Common Expenses incurred by the Association for each Assessment period unless Declarant otherwise elects to make a payment with respect to its unsold Lots as if such Lots were subject to Assessments described more fully below. If Declarant determines not to pay the difference between the amount of Assessments payable by Owners other than Declarant and the actual Common Expenses, then Declarant shall make a payment for the Lots which Declarant owns as if those Lots were subject to Assessments. Unless Declarant otherwise notifies the Board of Directors in writing at least sixty (60) days prior to the end of the fiscal year, Declarant shall be deemed to have elected to continue paying on the same basis as the preceding fiscal year. Declarant's obligations hereunder may be satisfied in the form of a cash subsidy or by "in kind" contributions of services or materials, or a combination of the same.

10.8 ENFORCEMENT OF ASSESSMENTS

A. Establishment of a Charge

The Association shall have a charge against each Lot to secure payment of any and all delinquent assessments, as well as interest at a rate not to exceed the highest rate allowed by applicable usury law as computed from the date the delinquency first occurs, and such late charges and fines as may be established by the Board of Directors and costs and reasonable attorneys' fees, upon compliance with Bahamian law. Such charge shall be superior to all other charges or liens, except (a) the charges or liens of all taxes, bonds, assessments, and other levies which by law would be superior, and (b) the lien or charge of any first mortgage of record, meaning any recorded mortgage with first priority over other mortgages made in good faith and for value. In the event of delinquency, such charge may be enforced by power of sale, suit, judgment or foreclosure and the exercise of any power of sale or other statutory, legal or equitable remedy shall be made in the same manner as mortgages on real property are enforced under Bahamian law. Each Assessment, together with interest, late charges, costs, and reasonable attorneys' fees, shall also be the personal obligation of the Person who was the Owner of such Lot at the time the Assessment arose, and his or her grantee shall be jointly and severally liable for such portion thereof as may be due and payable at the time of conveyance. All payments shall be applied first to costs and attorneys' fees, then to late charges, then interest, then to delinquent Assessments, then to any unpaid installments of the Common Assessment or Special Assessment in the order of their coming due.

The Association, acting on behalf of its Members, shall have the power to bid for the Lot or the other portions of the property so affected at a foreclosure sale and to acquire and hold, lease, mortgage, and convey the same. During the period in which the Lot or the other property so affected is owned by the Association following the exercise of any of its remedies: (a) no right to vote shall be exercised on its behalf; (b) no Assessment shall be levied on it; and (c) each other Lot shall be charged, in addition to its usual Assessment, its equal pro rata share of the Assessment that would have been charged against such Lot had it not been acquired by the Association. Suit to recover a money judgment for unpaid Common Expenses and attorneys' fees shall be maintainable without foreclosing or waiving the charge securing the same.

The sale or transfer of any Lot shall not affect the Assessment charge or relieve such Lot from the charge for any subsequent Assessments. In the event the first mortgagee shall exercise its power of sale, the Assessment charge shall be paid to the extent any monies remaining after the settlement of the sums due to the first mortgagee and the balance thereof (if any) shall be extinguished in respect of such Lot. The subsequent Owner of the foreclosed Lot shall not be personally liable for Assessments on such Lot due prior to such acquisition of title. Such unpaid Assessments shall be deemed to be Common Expenses collectible from Owners of all Lots subject to Assessment, including the new Owner, its successors and assigns.

B. <u>Power Of Attorney to Enforce Charge</u>

In consideration of the grant by Declarant to each Owner of the easements and rights contained in this Master Declaration, each Owner by its purchase of a Lot hereby irrevocably appoints the Association, or any person for the time being as the Association shall from time to time designate in writing under hand, to be attorney for the Owner and in the Owner's name and on the Owner's behalf and as for the Owner's act and deed or otherwise to sign seal and deliver and otherwise perfect any such legal or formal mortgage or registered charge as aforesaid or (without executing any such mortgage) any deed assurance or act which may be required or may be deemed proper on any sale by the Association of the Lot or of any part thereof under the power of sale conferred by the charge over the Lot and the statutes in that behalf in order to vest in a purchaser the legal estate and all other estate and interest in the Lot or part thereof as the case may be.

C. <u>Additional Remedies</u>

In addition to the remedies provided in this Section 10.7, in the event that Assessments or any part thereof due from an Owner to the Association remain unpaid for more than thirty (30) days after becoming payable (whether formally demanded or not) it shall be lawful for the Association at any time thereafter to do any one or more of the following in respect of any assessable property interest owned by such Owner:

(i) To grant the Owner's easements to any person becoming seized for an estate in fee simple thereof for a like term.

(ii) To cancel the one (1) Class A voting share of the Owner in the Association and to issue one (1) new Class A voting share in the Association as appurtenant to such assessable property interest.

(iii) To suspend the right of such Owner to use the Common Area or the Exclusive Common Area or any recreational facilities serving the Common Area or Exclusive Common Area for any period during which any charge against such assessable property interest remains delinquent.

10.9 RESERVE BUDGET

The Board of Directors may include in the budget each year a capital replacement reserve, which reserve may take into account the number and nature of replaceable assets, the expected life of each asset, and the expected repair or replacement cost.

ARTICLE XI
MAINTENANCE

11.1 ASSOCIATION'S RESPONSIBILITY

The Association shall maintain and keep in good repair all Area of Common Responsibility, such maintenance to be funded as herein provided. This maintenance shall include, but need not be limited to, maintenance, repair, and replacement of roadways, beach and shoreline, lakes, waterways, preserves, landscaping, flora, fauna, structures and improvements which form a part of the Common Area, the shoreline and the beach front running contiguous with the Property, including the channel entrance to the Marina, and any dredging for the maintenance thereof and such portions of any additional property included within the Area of Common Responsibility as may be dedicated by this Master Declaration, a resolution of the Board, or by an agreement for maintenance by the Association. Subject to Section 11.3, to the extent that the Community's entrance feature, including landscaping improvements, signage or other improvements is located in whole or in part on any Lot on the Property, this area shall be deemed to be part of the Area of Common Responsibility for all purposes hereunder and the Association and its agents and designees shall have an easement over and across the Lot for ingress and egress to perform maintenance on this portion of the Area of Common Responsibility.

All costs associated with maintenance, repair and replacement of Areas of Common Responsibility shall be a Common Expense to be allocated among Lots as part of the Common Assessment. All costs associated with maintenance, repair and replacement of Exclusive Common Area of a particular group of Lots shall be an expense of and shall be assessed against the Lots that are benefited by Exclusive Common Area.

The Association shall also be responsible for exterior grounds maintenance within any Neighborhood and maintenance, repair and replacement of other property within any Neighborhood to the extent designated in any Supplemental Declaration affecting the Neighborhood. As provided in this Master Declaration, or any other written agreement, the Association may also assume maintenance responsibilities with respect to any Neighborhood in addition to those designated by Supplemental Declaration.

The Association may maintain other property which it does not own, including, without limitation, property dedicated to the public, if the Board of Directors determines that such maintenance is necessary or desirable to maintain the Community-Wide Standard. The costs of such maintenance shall be allocated among the benefited Lots as a Common Assessment, Neighborhood Assessment, or Special Assessment against a particular Lot, as the Board of Directors determines appropriate.

11.2 Neighborhood Association's Responsibility

Any Neighborhood Association having responsibility for maintenance of all or a portion of the Property within a particular Neighborhood pursuant to Neighborhood Governing Documents shall perform such maintenance responsibility in a manner consistent with the Community-Wide Standard. If any such Neighborhood fails to perform its maintenance responsibility as required herein and in any Neighborhood Governing Documents, the Association may perform it and assess the costs against all Lots within such Neighborhood as provided in Article X of this Master Declaration.

11.3 Owner's Responsibility

Each Owner shall be obligated to landscape, irrigate and maintain his or her Lot or Unit and that portion of the road right-of-way adjacent to his Lot or Unit as designated on the Master Plan, lying between his Lot or Unit and the curb of the improved road in such road right-of-way, and bounded on either side by the extension of the Lot or Unit boundary lines to the road curb. Such landscaping, irrigation and maintenance shall be in conformance with the requirements of the ARC and in accordance with Article VI hereof and the Community-Wide Standards, including any required approval of the ARC, and including, without limitation, any requirement that same shall contain any improvements or other structures which would interfere with the use of the right-of-way for its intended purpose.

11.4 Landscape Maintenance

In accordance with Section 6.5, the Board of Directors of the Association may adopt Community-Wide Standards regarding landscape maintenance and irrigation, including but not limited to frequency and quantity of maintenance and frequency, quantity and time of day of irrigation. All such Community-Wide Standards shall be adopted in accordance with good agronomical practices. The Association may, but shall not be required to, provide landscape maintenance services to Lots on a voluntary contract basis.

11.5 ASSESSMENTS

All maintenance required by Sections 11.3 and 11.4 shall be performed in a manner consistent with the Community-Wide Standards. If any Neighborhood Association or Owner fails to perform its or his or her maintenance responsibility in accordance with the Community-Wide Standards, the Association may perform it and assess all costs incurred by the Association plus an administrative surcharge equal to ten percent (10%) of the amount assessed against the Lot and the Owner thereof as a Special Assessment. Prior to entry, the Association shall afford the Owner ten (10) days' written notice to remedy a condition inconsistent with the Community-Wide Standards, except when entry is required due to an emergency. All costs of maintenance of property within a Neighborhood shall be assessed as a Neighborhood Assessment against the Units within the Neighborhood to which the services are provided. The provisions of services in accordance with this paragraph shall not constitute discrimination within a class.

11.6 SANCTIONS

Sanctions under the Governing Documents may include (i) reasonable monetary fines (as determined by the Board of Directors), (ii) suspension of right to vote on matters before the Members of the Association, (iii) suspension of any special services rendered by the Association, (iv) suspension of the right to use any recreational facilities of the Association and (v) exclusion from the Property of any contractor, subcontractor, agent or other invitee of the Owner. The Board of Directors shall, in addition, have the power to seek relief in any court for violations of the Documents or to abate nuisances.

ARTICLE XII
INSURANCE AND CASUALTY LOSSES

12.1 INSURANCE

The Association acting through its Board, or its duly authorized agent, shall obtain and continue in effect blanket all-risk casualty insurance, if reasonably available, for all insurable improvements on the Common Area. If blanket all-risk coverage is not reasonably available, then at a minimum an insurance policy providing fire and extended coverage shall be obtained. This insurance shall be in an amount sufficient to cover one hundred percent (100%) of the replacement cost of any repair or reconstruction in the event of damage or destruction from any insured hazard.

In addition to casualty insurance on the Common Area, the Association may, in its discretion or upon request of a Neighborhood Association obtain and continue in effect adequate blanket all-risk casualty insurance, if reasonably available, on all insurable improvements on the Exclusive Common Area within the Neighborhood. If all-risk insurance is not reasonably available, then fire and extended coverage may be substituted. Such coverage may be in such form as the Board of Directors deems appropriate for one hundred percent (100%) of the replacement cost of all structures to be insured. The costs thereof shall be charged to the Owners of Lots within the benefited Neighborhood as a Neighborhood Assessment.

Insurance obtained on the improvements within any Neighborhood, whether obtained by the Neighborhood Association or the Association, shall at a minimum comply with the applicable provisions of this Section 12.1, including the provisions of this Article applicable to policy provisions, loss adjustment, and all other subjects to which this Article applies with regard to insurance on the Common Area. All such insurance shall be for the full replacement cost. All such policies shall provide for a certificate of insurance to be furnished to the Association and to the Neighborhood Association.

The Association shall also obtain a public liability policy covering the Common Area, the Association and its Members for all damage or injury caused by the negligence of the Association or any of its Members or agents. The public liability policy shall have the liability limits established by the Board of Directors from time to time.

Premiums for all insurance on the Common Area shall be Common Expenses of the Association and shall be included in the Common Assessment; premiums for insurance provided to Neighborhood Associations shall be included in Neighborhood Assessments. The policies may contain a reasonable deductible, and, in the case of casualty insurance, the amount thereof shall be added to the face amount of the policy in determining whether the insurance at least equals the full replacement costs. The deductible shall be paid by the party who would be liable for the loss or repair in the absence of insurance and in the event of multiple parties shall be allocated in relation to the amount each party's loss bears to the total.

All insurance coverage obtained by the Association shall be written in the name of the Association as trustee for the respective benefited parties, as further identified in subsection (b) below. Such insurance shall be governed by the provisions hereinafter set forth:

(a) All policies shall be written with a company authorized to do business in The Bahamas.

(b) All policies on the Common Area shall be for the benefit of the Association, its Members and Institutional Mortgagees, if any, as their interests may appear; all policies secured at the request of a Neighborhood shall be for the benefit of the Neighborhood Association, if any, the Owners of Lots within the Neighborhood, and their Institutional Mortgagees, as their interests may appear.

(c) Exclusive authority to adjust losses under policies obtained by the Association on the Property shall be vested in the Board of Directors; provided, however, no Institutional Mortgagee having an interest in such losses may be prohibited from participating in the settlement negotiations, if any, related thereto.

(d) In no event shall the insurance coverage obtained and maintained by the Association hereunder be brought into contribution with insurance purchased by individual Members, occupants, or their Institutional Mortgagees.

(e) All casualty insurance policies shall have an inflation guard endorsement, if reasonably available, and an agreed amount endorsement with an annual review by one or more qualified Persons.

(f) The Board of Directors shall be required to make every reasonable effort to secure insurance policies that will provide for the following:

(i) a waiver of subrogation by the insurer as to any claims against the Board of Directors, the Association's manager, Members, and their respective tenants, servants, agents, and guests;

(ii) a waiver by the insurer of its rights to repair and reconstruct, instead of paying cash;

(iii) a statement that no policy may be canceled, invalidated, suspended, or subject to non-renewal on account of any one or more individual Members;

(iv) a statement that no policy may be cancelled, invalidated, suspended, or subject to non-renewal on account of the conduct of any director, officer, or employee of the Association or its duly authorized manager without prior demand, in writing, delivered to the Association to cure the defect and the allowance of a reasonable time thereafter within which the defect may be cured by the Association, its manager, any Member, or Institutional Mortgagee;

(v) that any "other insurance" clause in any policy exclude individual Members' policies from consideration; and

(vi) that the Association will be given at least thirty (30) days' prior written notice of any cancellation, substantial modification, or non-renewal.

In addition to the other insurance required by this Article, the Board of Directors shall obtain, as a Common Expense, worker's compensation insurance, if and to the extent required by law, directors' and officers' liability coverage, if reasonably available, a fidelity bond or bonds on directors, officers, employees, and other persons handling or responsible for the Association's funds, if reasonably available and such other insurance as the Board, in its business judgment determines advisable to obtain. The amount of fidelity coverage shall be determined in the Board of Directors best business judgment but, if reasonably available, may not be less than three (3) months' Assessments on all Lots, plus reserves on hand. The Directors shall make all reasonable efforts to ensure that bonds shall contain a waiver of all defenses based upon the exclusion of persons serving without compensation and shall require at least thirty (30) days' prior written notice to the Association of any cancellation, substantial modification, or non-renewal.

12.2 Damage and Destruction

(a) Filing Claims. Immediately after damage or destruction by fire or other casualty to all or any part of the Property covered by insurance written in the name of the Association, the Board of Directors or its duly authorized agent shall proceed with the filing and adjustment of all claims arising under such insurance and obtain reliable and detailed estimates of the cost of repair or reconstruction of the damaged or destroyed property. Repair or reconstruction, as used in this paragraph, means repairing or restoring the property to substantially the same condition in which it existed prior to the fire or other casualty, allowing for any changes or improvements necessitated by changes in applicable building codes.

(b) Repair and Reconstruction. Any damage or destruction to the Common Area or to Exclusive Common Area shall be repaired or reconstructed unless Declarant (as long as Declarant owns any portion of the Property or Additional Property) and at least seventy-five percent (75%) of the total votes eligible to be cast by the Class "A" Members of the Association if Common Area is damaged (or at least seventy-five percent (75%) of the total votes eligible to be cast by the Class "A" Members of the Neighborhood whose Exclusive Common Area is damaged) shall decide within sixty (60) days after the casualty not to repair or reconstruct. If for any reason either the amount of the insurance proceeds to be paid as a result of such damage or destruction, or reliable and detailed estimates of the cost of repair or reconstruction, or both, are not made available to the Association within said period, then the period shall be extended until such funds or information shall be made available; provided, however, such extension shall not exceed sixty (60) additional days. No Institutional Mortgagee shall have the right to participate in the determination of whether the damage or destruction to Common Area, Exclusive Common Area or Lots shall be repaired or reconstructed. In the event that it should be determined in the manner described above that the damage or destruction to the Common Area or Exclusive Common Area shall not be repaired or reconstructed and no alternative improvements are authorized, then and in that event the affected portion of the Property shall be restored to its natural state and maintained by the Association in a neat and attractive condition consistent with the Community-Wide Standard.

12.3 DISBURSEMENT OF PROCEEDS

If the damage or destruction for which the proceeds of insurance policies are paid is to be repaired or reconstructed, the proceeds, or such portion thereof as may be required for such purpose, shall be disbursed in payment of such repairs or reconstruction as hereinafter provided. Any proceeds remaining after defraying such costs of repair or reconstruction to the Common Area or the Exclusive Common Area shall be retained by and for the benefit of the Association and placed in a capital improvements account. In the event no repair or reconstruction is made, any proceeds remaining after making such settlement as is necessary and appropriate with the affected Members and their Institutional Mortgagees as their interests may appear, shall be retained by and for the benefit of the Association and placed in a capital improvements account. This is a covenant for the benefit of any Institutional Mortgagee of a Lot and may be enforced by such Institutional Mortgagee.

12.4 REPAIR AND RECONSTRUCTION

If the damage or destruction to the Common Area or to Exclusive Common Area for which insurance proceeds are paid is to be repaired or reconstructed, and such proceeds are less than the cost thereof, the Board of Directors shall, without the necessity of a vote of the Members, levy a Special Assessment against all Owners on the same basis as provided for Common Assessments, provided, if the damage or destruction involves the Exclusive Common Area, only the Owners of Lots in the affected Neighborhood shall be subject to Assessment therefor. Additional Assessments may be made in like manner at any time during or following the completion of any repair or reconstruction.

12.5 INSURANCE

By virtue of taking title to a Lot, each Owner covenants and agrees to carry property insurance to the full replacement cost of all insurable improvements of the Lot and Unit, less a reasonable deductible. Each Owner further covenants and agrees that in the event of damage to or destruction of any portion of the Lot or Unit, the Owner shall promptly proceed to repair or to reconstruct the Lot or Unit in a manner consistent with the original construction or with such other plans and specifications approved in writing by the Town Architect or the ARC. Alternatively, the Owner shall clear and maintain the Lot in a neat and attractive condition consistent with the Community-Wide Standard. The Owner shall be responsible for payment of any costs that are not covered by insurance proceeds.

ARTICLE XIII
CONDEMNATION

Whenever all or any part of the Common Area shall be taken by any authority having the power of condemnation or eminent domain, or conveyed in lieu of and under threat of condemnation by the Board of Directors with the consent of Declarant, as long as Declarant owns any portion of the Property or the Additional Property, each Owner shall be entitled to notice thereof. The award made for such taking shall be payable to the Association as trustee for all Members to be disbursed as follows:

(a) If the taking involves a portion of the Common Area on which improvements have been constructed, then, unless within sixty (60) days after such taking Declarant (as long as Declarant owns any portion of the Property or Additional Property) and at least seventy-five percent (75%) of the total votes eligible to be cast by the Class "A" Members of the Association (or at least seventy-five percent (75%) of the total votes eligible to be cast by the Class "A" Members of the Neighborhood benefited by the Exclusive Common Area affected by such taking or conveyance) shall otherwise agree, the Association shall restore or reconstruct such improvements so taken on the remaining land included in the Common Area to the extent lands are available therefore, in accordance with plans approved by the Board of Directors of the Association. If such improvements are to be repaired or reconstructed, the above provisions of Sections 12.3 and 12.4 regarding the disbursement of funds, and any required Assessments, in respect to casualty damage or destruction which is to be repaired shall apply.

(b) If the taking does not involve any improvements on the Common Area, or if there is a decision made not to repair or restore, then such award or net funds shall be disbursed to the Association and used for such capital improvements as the Board of Directors of the Association shall determine.

(c) The Association may dedicate and reserve a portion of the Common Area for any governmental entity or quasi-governmental entity as the Board of Directors shall determine so long as the activity carried out on such property is consistent with the terms of this Declaration.

ARTICLE XIV
NO PARTITION

Except as is permitted in this Master Declaration or any amendments hereto, there shall be no judicial partition of the Common Area or any part thereof, nor shall any Person acquiring any interest in the Property or any part thereof seek any judicial partition unless the Property has been removed from the provisions of this Master Declaration. This Article shall not be construed to prohibit the Association from acquiring and disposing of tangible personal property, nor from acquiring title to real property which may or may not be subject to this Master Declaration.

ARTICLE XV
EASEMENTS AND OTHER RIGHTS

Declarant, the Association, any Neighborhood Association, the Club, the Albany Yacht Club, the Owners and such other Person as Declarant, as long as Declarant owns any portion of the Property or the Additional Property, or the Association may determine shall have an easement for the purposes of ingress and egress to the Property or portions thereof, in connection with exercising the rights and in carrying out the obligations set forth in the Governing Documents. Declarant may, by separate instruments to be recorded, grant exclusive and non-exclusive easements on, upon, over, across, through and under the Property for, among other things, the following purposes: (a) use of Common Area for all proper and normal purposes set forth herein; (b) ingress, egress and access to and from, through and between the Property; (c) inspecting any construction, proposed construction or improvements; (d) repairing or maintaining the Property, and any facilities or improvements thereon; (e) installing and maintaining the Community's utilities and drainage facilities; (f) encroachments for minor inaccuracies in survey, construction or reconstruction or due to settlement or movement; (g) errant golf balls; (h) maintenance, installation, construction and repair of utilities and facilities; (i) a right of access to each Lot in favor of the Association or a Neighborhood Association or the Club or Declarant's designee for maintaining, repairing, replacing and preserving the Common Area or the Club Property and (j) the right to create any nuisance (including the discharge of scents or the making of noise) as a result of the reasonable operation of the Club Property or Marina Property. Notwithstanding the absence of a separate recorded document, the rights set forth in this Article shall still exist for the purposes intended in the Governing Documents.

ARTICLE XVI
CABLE TELEVISION

16.1 CATV AGREEMENT

The Association may, but shall not be required to, enter into a bulk rate cable television agreement ("CATV Agreement") for the Community. If a CATV Agreement is entered into, all Lots for which a certificate of occupancy has been issued shall be charged for basic cable service as part of the Common Assessment, regardless of whether the Owner desires cable television service. In addition, tiers, remotes, pay channels and other services may be offered by the cable provider on an individual subscriber basis.

16.2 Easements

Declarant and the Association shall have the right to grant easements to the cable provider for installation, maintenance and repair of the cable television system, including without limitation head-ends, wiring, switches and amplifiers. The cable provider shall also have the right to use easement area dedicated for utilities. Notwithstanding anything to the contrary, the cable provider shall retain ownership of all cable television equipment installed within the Community.

16.3 Prewire

The cable provider shall be permitted to pre-wire each Unit constructed within the Community for cable television service at its sole cost and expense. Each Owner acknowledges that the prewire installed within the Unit shall be and remain personal property of the cable provider. Owners shall have no ownership interest in the prewire and the right of use thereof shall remain solely with the cable provider. Each Owner by acceptance of title to a Unit hereby acknowledges that Declarant shall reserve an irrevocable right which may be assigned to any cable provider to install and maintain the prewire in the Unit and agrees not to permit any other provider of cable television to utilize the prewire without the prior written consent of the cable provider, which consent may be withheld by the cable provider in its discretion. Upon termination of the CATV Agreement, if any, the cable provider may, but is not obligated to, remove all or any portion of the prewire within the Unit, after reasonable notice to the Owner, provided no material or substantial injury to the real property would result from such removal.

ARTICLE XVII
TELECOMMUNICATIONS AND SURVEILLANCE SYSTEMS; LIMITED ACCESS

Declarant reserves unto itself and its designees, successors, assigns and licensees the right to enter into one or more contracts for the provision of one or more master telecommunications receiving and distribution systems and electronic surveillance systems (all or any part of which shall be referred to herein as the "System") for all or any part of the Property. The exact description, location and nature of the System has not yet been fixed or determined. Declarant will reserve for itself and its designees, successors, assigns and licensees a perpetual and exclusive right, privilege, easement and right-of-way across, over and upon the Property for the installation, construction and maintenance of the System together with a perpetual and exclusive right, privilege and easement of unlimited ingress and egress, access, over and upon the Property for installing, constructing, inspecting, maintaining, altering, moving, improving and replacing facilities and equipment constituting the System. If and to the extent services provided by the System are to serve all of the Lots, then the cost of the System may be a Common Expense of the Association and shall be included in the Common Assessment. If any services provided by the System are provided only to some but not all of the Lots, then the cost of any such services may be an expense for the benefit of the Lots so served and shall be assessed as a Special Assessment against such Lots.

The Association may, but shall not be obligated to, maintain or support certain activities within the Community designed to limit access to the Property and make the Property safer than it otherwise might be. Neither the Association, Declarant, nor any successor of Declarant shall in any way be considered insurers or guarantors of security within the Property, and neither the Association, Declarant, nor any successor of Declarant shall be held liable for any loss or damage by reason or failure to provide adequate security or ineffectiveness of security measures undertaken. All Owners and occupants of any Unit, and the tenants, guests and invitees of any Owner, as applicable, acknowledge that the Association and its Board of Directors, and Declarant, any successor of Declarant and the Town Architect or the ARC do not represent or warrant that any fire protection system, burglar alarm system or other security system designated by or installed according to guidelines established by Declarant or the Town Architect or the ARC may not be compromised or circumvented, that any fire protection or burglar alarm systems or other security systems will prevent loss by fire, smoke, burglary, theft, hold-up, or otherwise, nor that fire protection or burglar alarm systems or other security systems will in all cases provide the detection or protection for which the system is designed or intended. Each Owner, and occupant of any Unit, and each tenant, guest and invitee of any Owner, as applicable, acknowledges and understands that the Association, the Board of Directors, Declarant, or any successor of Declarant are not insurers and that each Owner and occupant of any Unit and each tenant, guest and invitee of any Owner assumes all risks for loss or damage to persons, to Units and to the contents of Units and further acknowledges that the Association, the Board of Directors, Declarant, or any successor of Declarant have made no representations or warranties, nor has any Owner, occupant, tenant, guest or invitee relied upon any representations or warranties, expressed or implied, including any warranty or merchantability or fitness for any particular purpose, relative to any fire and/or burglar alarm systems or other security systems recommended or installed or any security measures undertaken within the Community.

ARTICLE XVIII
DECLARANT'S RIGHTS

18.1 PURPOSE

The purpose of this Article XVIII is to set forth certain Declarant rights, and to refer, for ease of reference, to certain other Declarant rights set forth in this Master Declaration. The purpose of this Article XVIII shall in no way be a limitation of any rights of Declarant otherwise set forth in this Master Declaration.

18.2 DURATION OF RIGHTS

The rights of Declarant set forth in this Master Declaration that refer to this Article XVIII shall extend for a period of time ending when Declarant no longer owns any portion of the Property or the Additional Property or such earlier date as determined by Declarant, in its sole and absolute discretion.

18.3 DECLARANT'S RIGHTS IN THE ASSOCIATION

Prior to and after the Turnover Date and until Declarant no longer owns any portion of the Property or the Additional Property, whether Declarant exercises the right to appoint all of the Board of Directors or not, the Board shall have no authority to, and shall not, without the prior written consent of Declarant, which may be withheld for any or no reason whatsoever, undertake any action which shall:

(a) prohibit or restrict in any manner the sales and marketing program of Declarant, or the leasing activities of Declarant;

(b) decrease the level of maintenance services provided by the Association;

(c) change the Person appointed as the Town Architect or the membership of the ARC or diminish its powers as stated herein;

(d) alter or amend this Master Declaration, the Memorandum or the Articles;

(e) terminate or waive any rights of the Association under this Master Declaration;

(f) convey, lease, mortgage, alienate, pledge or grant any easements on, any portion of the Common Area or Exclusive Common Area;

(g) accept the conveyance, lease, mortgage, alienation or pledge of any real or personal property to the Association;

(h) terminate or cancel any easements granted hereunder or by the Association;

(i) terminate or impair in any fashion any easements, powers or rights of Declarant hereunder;

(j) restrict Declarant's rights of use, access and enjoyment of any of the Property; or

(k) cause the Association to default on any obligation of the Association under any contract or this Master Declaration.

In any such matter, Declarant's consent shall be exercised by its representative on the Board or other Person designated to so act by Declarant.

18.4 Right of Declarant to Disapprove Actions

From the Turnover Date and until Declarant no longer owns any portion of the Property or the Additional Property, Declarant shall have a right to disapprove actions of the Board and any committees, as is more fully provided in this Article. This right shall be exercisable only by Declarant, its successors, and assigns who specifically take this power in a recorded instrument, or who become a successor Declarant pursuant to a recorded assignment or court order. No action authorized by the Board of Directors or any committee shall become effective, nor shall any action, policy or program be implemented until ten (10) days following Declarant's receipt of notice of the action taken at the meeting held pursuant to the terms and provisions hereof. At any time prior to the expiration of such ten (10) day period, Declarant may exercise its right to disapprove actions of the Board and any committees and the Association shall not take any action or implement any policy, program or rule or regulation previously approved by the Association that Declarant has disapproved.

This right to disapprove shall not extend to the requiring of any action or counteraction on behalf of any committee, or the Board or the Association. Declarant shall not use its right to disapprove to reduce the level of services which the Association is obligated to provide or to prevent capital repairs or any expenditure required to comply with applicable laws and regulations.

18.5 Recognition by Owners of Declarant's Rights to Develop and Construct Improvements on the Property

Each Owner on his, her or its own behalf and on behalf of such Owner's heirs, personal representatives, successors, mortgagees, lienors and assigns acknowledges and agrees that the completion of the development of the Community may occur over an extended period of time and that incident to such development and the construction associated therewith the quiet use and enjoyment of the Property and each portion thereof may be temporarily interfered with by the development and construction work occurring on those portions of the Property and the Additional Property owned by Declarant or its successors and assigns. Each Owner, and on behalf of such Owner's heirs, assigns, personal representatives, successors, mortgagees, and lienors does hereby waive all claims for interference with such quiet enjoyment and use as a result of the development and construction of any portion of the Property or the Additional Property. Each Owner on behalf of such Owner's heirs, personal representatives, successors, Institutional Mortgagees, lienors and assigns agrees that the development, construction and completion of the Property and the Additional Property may interfere with such Owner's original and existing views, light and air and diminish the same and each such Owner, and on behalf of such Owner's heirs, assigns, personal representatives, successors, Mortgagees, and lienors does hereby release Declarant and its successors in interest and others involved from all claims that they may have in connection therewith.

18.6 Declarant's Rights in Connection with Development

Declarant and its successors or assigns and Sub-developers intend to undertake the work of constructing buildings, dwellings and improvements related thereto. The completion of that work and the sale, resale, rental and other disposal of Lots is essential to the establishment and welfare of the Community. In order that such work may be completed and the Community established as a fully occupied Community as rapidly as possible, no Owner or the Association shall do anything to interfere with Declarant's or any Sub-developer's activities. Without limiting the generality of the foregoing, nothing in the Governing Documents shall be understood or construed to prevent Declarant, its successors or assigns, or its or their contractors or subcontractors and their representatives from:

(a) doing on any property owned by them whatever they determine to be necessary or advisable in connection with the completion of such work, including without limitation, the alteration of its construction plans and designs as Declarant or any Sub-developer deems advisable in the course of development (all models or sketches showing plans for future development may be modified by Declarant or any Sub-developer at any time and from time to time, without notice); or

(b) erecting, constructing and maintaining on any property owned or controlled by Declarant or Sub-developer, or their successors or assigns or its or their contractors or subcontractors, such structures as may be reasonably necessary for the conduct of its or their business of completing said work and establishing Albany as a community and disposing of the same by sale, lease or otherwise; or

(c) conducting on any property owned or controlled by Declarant, any Sub-developer or their successors or assigns, its or their business of developing, subdividing, grading and constructing improvements on such property and of disposing of Lots therein by sale, resale, lease or otherwise.

Declarant expressly reserves the right to grant easements and rights-of-way over, under and through the Common Areas so long as Declarant owns any portion of the Property or the Additional Property primarily for development and/or resale; provided, no such easement shall materially interfere with the use of Common Area by the Members.

18.7 FUTURE EASEMENTS AND MODIFICATIONS

Declarant reserves the right to grant, modify or enter into easements, dedications, agreements, licenses, restrictions, reservations, covenants and rights of way, to modify the boundary lines and to plat or replat portions of the Property and the Additional Property, for development of the Community. The Association and each Owner and mortgagee of a portion of the Property agree to execute and deliver any and all agreements, documents, plats and instruments that are necessary or desirable to accomplish the same.

18.8 CONSTRUCTION; MARKETING

In recognition of the fact that Declarant will have a continuing and substantial interest in the development and administration of the Property and the Additional Property, Declarant hereby reserves for itself, its successors, designees and assigns, the right to grant easements over, under and through the Common Area, the Property and the Additional Property and the right to use the Common Area and to use all other portions of the Property and the Additional Property owned by Declarant or the Association in conjunction with and as part of its program of selling, leasing, constructing, marketing, and developing any property owned or controlled by Declarant or its successors, designees or assignees including, but not limited to, the right to enter and transact business, maintain management offices, maintain models and sales, resales and rental offices, place signs, employ sales and rental personnel, carry on construction, store construction materials and construct and assemble construction components, show Lots and Units owned by Declarant, and use any portion of the Property, Common Area, Lots, Units and other improvements owned by Declarant or the Association for purposes set forth above without any cost to Declarant and its successors, nominees and assigns for such rights and privileges.

In addition Declarant, its successors, designees and assigns, shall have the right to construct, maintain and use sales, resales, rental, management and construction offices within the Community. Any models, sales areas, sales, resales or rental centers, management offices, parking areas, construction offices, signs and any other designated areas or other property pertaining to the sale, construction and marketing efforts of Declarant shall not be part of the Common Area or Exclusive Common Area and shall remain the property of Declarant or its nominees, as the case may be.

Declarant shall have the right to construct, maintain and repair structures and landscaping and other improvements to be located on any portion of the Property owned by Declarant or the Association as Declarant deems necessary or appropriate for the development of any portion of the Property or the Additional Property. Declarant's use of any portion of the Property or the

Additional Property as provided in this Article shall not be a violation of the Governing Documents. Notwithstanding anything to the contrary herein, the right of Declarant to maintain a resale office on any portion of the Property or the Additional Property owned by Declarant or the Association and to use the Common Area in connection therewith shall be for a term coterminous with the term of the Master Declaration and shall not terminate at the expiration of the time described in Section 18.2 above.

18.9 Scope

The rights and privileges of Declarant, its successors, designees and assigns, as herein set forth or referred to above are in addition to and in no way limit any other rights or privileges of Declarant, its successors, designees and assigns, under any of the Governing Documents. The provisions above, like other provisions of this Master Declaration, grant or reserve rights to and for Declarant that may not be suspended, superseded or modified in any manner unless same is consented to by Declarant, and such rights may be assigned in writing by Declarant in whole or in part as Declarant deems appropriate. As used in this Master Declaration, the words "its successors or assigns" specifically do not include purchasers of Lots unless specifically designated as such in a Supplemental Declaration.

ARTICLE XIX
MORTGAGEE PROVISIONS

The following provisions are for the benefit of Institutional Mortgagees. The provisions of this Article apply to both this Master Declaration and to the Articles, notwithstanding any other provisions contained therein.

19.1 Notices of Action

An Institutional Mortgagee who provides written request to the Association (such request to state the name and address of such holder, insurer, or guarantor and the number of the Lot or Unit held, insured or guaranteed by the Institutional Mortgagee, as the case may be, therefore becoming an "eligible holder"), will be entitled to timely written notice of:

(a) any condemnation loss or any casualty loss which affects a material portion of the Property or which affects any Lot on which a first mortgage is held, insured, or guaranteed by such eligible holder;

(b) any delinquency in the payment of assessments or charges owed by any Owner of a Lot subject to the mortgage of such eligible holder; or

(c) any lapse, cancellation, or material modification of any insurance policy maintained by the Association.

19.2 Notice to Association

Upon request, each Owner shall be obligated to furnish to the Association the name and address of the holder of any mortgage encumbering such Owner's Lot.

ARTICLE XX
ALBANY GOLF & BEACH CLUB

20.1 CLUB MEMBERSHIP

Membership in Albany Golf & Beach Club is subject to the terms and conditions of the Club Membership Plan Documents.

In the event the Albany Golf & Beach Club is converted from a non-equity club to a member-owned equity club, the Club Membership Plan Documents shall also include the Albany Golf & Beach Club Equity Membership Plan, the memorandum of association, the articles of association and the Membership Purchase Agreements relating to the equity club.

Membership in Albany Golf & Beach Club requires the payment of a membership purchase price called a membership initiation fee, membership dues, fees and other amounts (the "Club Charges"). Club Charges shall be determined by the Club and are subject to change as contemplated by the Club Membership Plan Documents. Delinquent Club Charges are deemed to constitute Special Assessments. The Association shall, for the benefit of the Club, have a charge against each Lot for all unpaid Special Assessments in accordance with the charge and foreclosure provisions set forth in Article X. In the event that the Association does not enforce its rights hereunder with respect to a Special Assessment resulting from delinquent Club Charges, the Association hereby consents and authorizes the Club to enforce the charge and foreclosure provisions of Article X. Transfer of a Club membership shall be in accordance with the Club Membership Plan Documents.

20.2 CLUB PROPERTY

The Club Property is privately owned and operated by the Club and is not a part of the Common Area hereunder. The Club has the exclusive right to determine from time to time, in its sole discretion and without notice or approval of any change, how and by whom the Club Property shall be used. By way of example, but not limitation, the Club has the right to approve users and determine eligibility for use, to reserve use rights for future purchasers of Lots or Units within the Community, to terminate any or all use rights, to change, eliminate or cease operation of any or all of the Club Property, to transfer any or all of its rights to the Club Property or the operation thereof to anyone and on any terms which it deems appropriate, to limit the availability of use privileges, and to require the payment of a purchase price, initiation fee, membership deposit, dues and other charges for use privileges. OWNERSHIP OF A LOT OR UNIT OR ANY PORTION OF THE PROPERTY OR MEMBERSHIP IN THE ASSOCIATION DOES NOT GIVE ANY VESTED RIGHT OR EASEMENT, PRESCRIPTIVE OR OTHERWISE, TO USE THE CLUB PROPERTY, OR TO ACQUIRE A MEMBERSHIP IN THE CLUB AND DOES NOT GRANT ANY OWNERSHIP OR MEMBERSHIP INTEREST IN THE CLUB OR THE CLUB PROPERTY.

20.3 ACKNOWLEDGEMENTS REGARDING CLUB PROPERTY

Each Owner, by acceptance of a deed or recorded contract of sale to a Lot acknowledges:

(a) That the privilege to use the Club Property shall be subject to the terms and conditions of the Club Membership Plan Documents for the Club, as the same may be amended from time to time. Acquisition of a membership in the Club requires the payment of the Club Charges. These amounts shall be determined by Declarant and/or the Club as set forth in the Club Membership Plan Documents.

(b) Notwithstanding the fact that the Club Property is open space or a recreation area for purposes of applicable zoning ordinances and regulations, each Owner by acquisition of title to a Lot releases and discharges forever Declarant, the Club and their respective partners, employees, agents, directors, shareholders, officers and affiliates and their respective successors and assigns from: (1) any claim that the Club Property is, or must be, owned and/or operated by the Association or the Owners, and/or (2) any claim that the Owners are entitled to use the Club Property by virtue of their ownership of a Lot without acquiring a membership in the Club, paying the applicable Club Charges established by the Club from time to time, and complying with the terms and conditions of the Club Membership Plan Documents.

Each Owner and the Association shall jointly and severally indemnify, defend, and hold harmless Declarant, the Club, and their respective partners, employees, agents, directors, shareholders, officers and affiliates and their respective successors and assigns, against and in respect of, and to reimburse Declarant, the Club, and their respective partners, employees, agents, directors, shareholders, officers and affiliates and their respective successors and assigns on demand for, any and all claims, demands, losses, costs, expenses, obligations, liabilities, damages, recoveries, and deficiencies, including, but not limited to, interest, penalties, attorney and paralegal fees and disbursements (even if incident to any appeals), that Declarant, the Club, and their respective partners, employees, agents, directors, shareholders, officers and affiliates and their respective successors and assigns shall incur or suffer, which arise out of, result from, or relate to any claim that because the Club Property is deemed to be open space or a recreation area for purposes of applicable zoning ordinances and regulations, the Club Property must be owned and/or operated by the Association or the Owners and/or that Owners may use the Club Property without acquiring a membership in the Club pursuant to the Club Membership Plan Documents and paying the Club Charges established by the Club from time to time.

(c) That any entry upon the Club Property without permission of the Club may be deemed a trespass, and each Owner shall refrain from, and shall cause all occupants of such Owner's Lot, their guests and invitees to refrain from, any unauthorized entry upon the Club Property;

(d) That the proximity of Lots and Common Area to the Club Property results in certain foreseeable risks, including the risk of damage or injury from errant golf balls, or recovery thereof, and that each Owner's use and enjoyment of his or her Lot and the Common Area may be limited as a result and that neither the Association, Declarant nor the Club shall have any obligation to take steps to remove or alleviate such risks, nor shall they have any liability to any Owner or occupant of any Lot, their guests or invitees, for damage or injury resulting from errant golf balls being hit upon any Lots or Common Area or recovery thereof;

(e) That the Club and its designees may add to, remove or otherwise modify the landscaping, trees, and other features of the Club Property, including changing the location, configuration, size and elevation of bunkers, fairways and greens and constructing fences, and that neither the Club, Declarant, nor the Association, shall have any liability to Owner as a result of such modifications to the Club Property;

(f) That there are no express or implied easements over the Club Property for view purposes, and no guaranty or representation is made by Declarant or any other Person that any view over and across the Club Property will be preserved without impairment, and that neither the Club, Declarant nor the Association shall have any obligation to prune or thin trees or other landscaping to preserve views over the Club Property;

(g) That no representations or warranties which are inconsistent with this Article, either verbal or written, have been made or are made by Declarant or the Association or by any person acting on behalf of any of the foregoing; and

20.4 Rights of Access and Parking

The Club and members of Albany Golf & Beach Club (regardless of whether such Persons are Members hereunder), their guests and invitees and the employees, agents, contractors, and designees of the Club shall at all times have a right and a non-exclusive easement of access and use over all roadways located within the Property reasonably necessary to travel to and from the entrance of the Community from and to the Club Property, respectively, and, further, over those portions of the Property (whether Common Area or otherwise) reasonably necessary for the use operation, maintenance, repair, and replacement of the Club Property. Without limiting the generality of the foregoing, members of the Albany Golf & Beach Club and permitted members of the public shall have the right to use the pedestrian and golf cart paths located throughout the Property and to park their vehicles on the roadways located within the Property at reasonable times before, during, and after tournaments and other functions held at the Club Property.

20.5 Assumption of Risk and Indemnification

Each Owner by its purchase of a Lot expressly assumes the risks associated with the Club Property (regardless of whether the Owner is using the Club Property) and agrees that neither Declarant, the Club, the Association, nor any of their affiliates or agents nor any other entity designing, constructing, owning or managing the Club Property or planning or constructing the Owner's Lot or Unit shall be liable to Owner or any other person claiming any loss or damage, including, without limitation, indirect, special or consequential loss or damage arising from personal injury, destruction of property, loss of view, scent or noise pollution, or other visual or audible offenses, or trespass or any other alleged wrong or entitlement to remedy based upon, due to, arising from or otherwise related to the proximity of the Owner's Lot or Common Area to the Club Property, including, without limitation, any claim arising, in whole or in part, from the negligence of Declarant, or any other entity designing, constructing, owning or managing the Club Property or planning or constructing the Owner's Lot or Unit. Each Owner hereby agrees to indemnify and hold harmless Declarant, the Club and any other entity owning or managing the Club Property against any and all claims by Owner's guests and invitees.

20.6 Landscape Easement

By recordation of this Master Declaration, Declarant does hereby reserve for itself and the Club and the members of Albany Golf & Beach Club, a perpetual alienable and transferable easement over, across and upon each and every Lot which abuts or is contiguous to the Club Property for the purpose of the operation and the maintenance of the Club Property, including, but not limited to, the use of usual and common equipment for irrigation, maintenance and landscaping thereof, which easement shall specifically constitute a part of the Club Property. By way of example and not limitation, such easement shall permit entry onto an Owner's Lot for the purpose of planting grass, applying fertilizer, mowing and edging and removing any underbrush, trash, debris and trees.

20.7 Golf Play Easement

By recordation of this Master Declaration, Declarant does hereby reserve for itself and the Club and the members of Albany Golf & Beach Club, a perpetual alienable and transferable easement over, across and upon each and every Lot which abuts or is contiguous to the Club Property for the purpose of doing every act necessary and proper to the playing of golf on the Club Property, which shall include, but not be limited to, the recovery of golf balls from any Lot, the flight of golf balls over and upon any Lot, the usual and common noise level created by the playing of golf, and the usual and common activities associated with the operation and maintenance of the Club Property. Nothing herein however, shall be deemed to permit the playing of golf on any Lot, it being the intention of this easement that golf play should be limited to the Club Property.

ARTICLE XXI
ALBANY YACHT CLUB

21.1 Marina Property

The Marina Property is privately owned and/or lease and operated by the Albany Yacht Club and is not a part of the Common Area hereunder. The Albany Yacht Club has the exclusive right to determine from time to time, in its sole discretion and without notice or approval of any change, how and by whom the Marina Property shall be used. By way of example, but not limitation, the Albany Yacht Club has the right to approve users and determine eligibility for use, to reserve use rights for future purchasers of Lots or Units within the Community, to terminate any or all use rights, to change, eliminate or cease operation of any or all of the Marina Property, to transfer any or all of its rights to the Marina Property or the operation thereof to anyone and on any terms which it deems appropriate, to limit the availability of use privileges, and to require the payment of a purchase price, lease payment and other charges for use privileges. OWNERSHIP OF A LOT OR UNIT OR ANY PORTION OF THE PROPERTY OR MEMBERSHIP IN THE ASSOCIATION DOES NOT GIVE ANY VESTED RIGHT OR EASEMENT, PRESCRIPTIVE OR OTHERWISE, TO USE THE MARINA PROPERTY AND DOES NOT GRANT ANY OWNERSHIP INTEREST IN THE ALBANY YACHT CLUB OR THE MARINA PROPERTY.

21.2 Acknowledgements Regarding Marina Property

Each Owner, by acceptance of a deed or recorded contract of sale to a Lot acknowledges:

(a) That the privilege to use the Marina Property shall be subject to the terms and conditions set forth by the Albany Yacht Club from time to time.

(b) Notwithstanding the fact that the Marina Property is open space or a recreation area for purposes of applicable zoning ordinances and regulations, each Owner by acquisition of title to a Lot releases and discharges forever Declarant, the Albany Yacht Club and their respective partners, employees, agents, directors, shareholders, officers and affiliates and their respective successors and assigns from: (1) any claim that the Marina Property is, or must be, owned and/or operated by the Association or the Owners, and/or (2) any claim that the Owners are entitled to use the Marina Property by virtue of their ownership of a Lot.

Each Owner and the Association shall jointly and severally indemnify, defend, and hold harmless Declarant, the Albany Yacht Club, and their respective partners, employees, agents, directors, shareholders, officers and affiliates and their respective successors and assigns, against and in respect of, and to reimburse Declarant, the Albany Yacht Club, and their respective partners, employees, agents, directors, shareholders, officers and affiliates and their respective successors and assigns on demand for, any and all claims, demands, losses, costs, expenses, obligations, liabilities, damages, recoveries, and deficiencies, including, but not limited to, interest, penalties, attorney and paralegal fees and disbursements (even if incidental to any appeals), that Declarant, the Albany Yacht Club, and their respective partners, employees, agents, directors, shareholders, officers and affiliates and their respective successors and assigns shall incur or suffer, which arise out of, result from, or relate to any claim that because the Marina Property is deemed to be open space or a recreation area for purposes of applicable zoning ordinances and regulations, the Marina Property must be owned and/or operated by the Association or the Owners and/or that Owners may use the Marina Property.

(c) That any entry upon the Marina Property without permission of the Albany Yacht Club may be deemed a trespass, and each Owner shall refrain from, and shall cause all occupants of such Owner's Lot, their guests and invitees to refrain from, any unauthorized entry upon the Marina Property;

(d) That the proximity of Lots and Common Area to the Marina Property results in certain foreseeable risks, and that each Owner's use and enjoyment of his or her Lot and the Common Area may be limited as a result and that neither the Association, Declarant nor the Albany Yacht Club shall have any obligation to take steps to remove or alleviate such risks;

(e) That there are no express or implied easements over the Marina Property for view purposes, and no guaranty or representation is made by Declarant or any other Person that any view over and across the Marina Property will be preserved without impairment, and that neither the Albany Yacht Club, Declarant nor the Association shall have any obligation to prune or thin trees or other landscaping to preserve views over the Marina Property; and

(f) That no representations or warranties which are inconsistent with this Article, either verbal or written, have been made or are made by Declarant or the Association or by any person acting on behalf of any of the foregoing.

21.3 RIGHTS OF ACCESS AND PARKING

The Albany Yacht Club and all permitted users of the Marina Property, their guests and invitees and the employees, agents, contractors, and designees of the Albany Yacht Club shall at all times have a right and a non-exclusive easement of access and use over all roadways located within the Property reasonably necessary to travel to and from the entrance of the Community from and to the Marina Property, respectively, and, further, over those portions of the Property (whether Common Area or otherwise) reasonably necessary for the use, operation, maintenance, repair, and replacement of the Marina Property.

21.4 ASSUMPTION OF RISK AND INDEMNIFICATION

Each Owner by its purchase of a Lot expressly assumes the risks associated with the Marina Property (regardless of whether the Owner is using the Marina Property) and agrees that neither Declarant, the Albany Yacht Club, the Association, nor any of their affiliates or agents nor any other entity designing, constructing, owning or managing the Marina Property or planning or constructing the Owner's Lot or Unit shall be liable to any Owner or any other person claiming any loss or damage, including, without limitation, indirect, special or consequential loss or damage arising from personal injury, destruction of property, loss of view, scent or noise pollution, or other visual or audible offenses, or trespass or any other alleged wrong or entitlement to remedy based upon, due to, arising from or otherwise related to the proximity of the Owner's Lot or Common Area to the Marina Property, including, without limitation, any claim arising, in whole or in part, from the negligence of Declarant, or any other entity designing, constructing, owning or managing the Marina Property or planning or constructing the Owner's Lot or Unit. Each Owner hereby agrees to indemnify and hold harmless Declarant, the Albany Yacht Club and any other entity owning or managing the Marina Property against any and all claims by Owner's guests and invitees.

21.5 LANDSCAPE EASEMENT

By recordation of this Master Declaration, Declarant does hereby reserve for itself and the Albany Yacht Club, a perpetual alienable and transferable easement over, across and upon each and every Lot which abuts or is contiguous to the Marina Property for the purpose of the operation and the maintenance of the Marina Property, including, but not limited to, the use of usual and common equipment for irrigation, maintenance and landscaping thereof, which easement shall specifically constitute a part of the Marina Property. By way of example and not limitation, such easement shall permit entry onto an Owner's Lot for the purpose of planting grass, applying fertilizer, mowing and edging and removing any underbrush, trash, debris and trees.

ARTICLE XXII
WATER AND SEWER SERVICE

Pursuant to a Water and Sewer Service Agreement by and between Declarant and its affiliate and the Association (the "Water and Sewer Service Agreement"), the Association shall own, operate and maintain equipment, pipelines and other facilities for providing potable water, and the treatment and disposal of waste water and sewage, for all Lots in the Community (the "Water and Sewer Service Facilities"). The Association shall own, operate and maintain the Water and Sewer Service Facilities as part of the Common Areas. All Owners desiring water and sewer service shall make arrangements with the Association for connection to the Water and Sewer Service Facilities. The Association shall be the exclusive provider of such services within the Property. Notwithstanding the foregoing, either Declarant or the Association in their sole discretion may elect to convey ownership of the Water and Sewer Service Facilities to a third party to own and operate the Water and Sewer Service Facilities in accordance with applicable law. If the Water and Sewer Service Facilities are conveyed to a third party, the provisions of this Article XXII shall remain in full force and effect after such conveyance, provided that all references to the Association in this Article shall thereafter apply only to the third party owner of the Water and Sewer Service Facilities.

In connection with Declarant's platting of the Property from time to time, Declarant shall designate those portions of the Property, if any, upon which sewer and water treatment plants and other facilities are to be constructed. These parcels so designated by Declarant shall ultimately be conveyed to and accepted by the Association as Common Area without the payment of any additional consideration by the Association.

Each Owner for themselves, and their heirs, successors and assigns, hereby grants the Association a perpetual, non-exclusive easement for the installation, operation and maintenance of the Water and Sewer Service Facilities, including (without limitation) the installation, operation and maintenance of additional Water and Sewer Service Facilities from time to time as may be deemed necessary or desirable by the Association.

Each Owner by acceptance of a deed to a Lot covenants and agrees to pay to the Association one-time only water and sewer connection or hook-up fees at the time the Owner's Unit is connected to the Water and Sewer Service Facilities (the "Hook-Up Fees"). The Association shall pay the Hook-Up Fees to Declarant to reimburse Declarant for the cost of constructing and installing the connections to the Water and Sewer Service Facilities as provided in the Water and Sewer Service Agreement. Each Owner also covenants and agrees to pay the Association periodic water and sewer service fees and charges, as levied by the Association from time to time with respect to water and sewer service (collectively, the "Water and Sewer Charges") and to abide by the standardized provisions adopted by the Association regarding the operation of the Water and Sewer Service Facilities governing such matters as procedures for billing, penalties for non-payment and other matters related to the efficient operation and administration of the Water and Sewer Service Facilities. The Water and Sewer Charges may be billed separately to the Owner by the Association, or may be included in the Owner's Assessments, as determined by the Board from time to time.

In the event that any Owner does not pay all Hook-Up Fees and Water and Sewer Charges levied by the Association with respect to such Owner's Lot, the Association may file a charge on the Owner's Lot in favor of the Association, in the same manner as the charge for Association Assessments described in Article XI hereof, or may take other actions as may be provided in the standardized provisions adopted by the Association.

ARTICLE XXIII
BUILD COMPULSION

Build Compulsion. Each Owner by accepting a deed or other instrument conveying a Lot in Albany hereby grants to Declarant the option of re-purchasing the Owner's Lot at anytime during the period of 15 years (the "Option Period") after the purchase of the Lot if the Owner shall fail to commence construction within the period of eighteen (18) months from the completion date of the purchase of the Lot (the "first exercise date") and the further option of repurchasing the Lot at any time during the Option Period if the Owner shall fail to complete the construction and development within three (3) years from the date of commencement of construction (the "second exercise date") and in either case for an estate in fee simple in possession subject only to the provisions of the conveyance but otherwise free from encumbrances at the purchase price paid by the Owner in the case of the first exercise date and the purchase price plus the cost of the construction (excluding architect and surveyor's fees) of any structures on the Lot in respect of the second exercise. Upon the written request of an Owner, Declarant may in its sole and absolute discretion extend the periods mentioned herein in which case the respective exercise dates shall occur at the expiration of such extended periods.

ARTICLE XXIV
COMMUNITY ENHANCEMENT FEE

Each Owner or beneficial owner of a Lot or Unit shall notify Declarant of any change of the beneficial ownership of a Lot or Unit through the conveyance or the transfer of such Lot or Unit or beneficial ownership interest of any shares or equity interest in the Owner of such Lot or Unit. Declarant shall have the authority to assess a community enhancement fee against each Owner in respect of a transfer or conveyance which results in the change of the beneficial owner of a Lot or Unit except an exempt transfer as provided in this Article, for the benefit of the Community and the Bahamian public. Examples include the creation of a public beach, improvements to the surrounding village of Adelaide and/or the improvement of the surrounding shoreline. The amount of the community enhancement fee shall be Two Thousand Five Hundred Dollars ($2,500) payable to Declarant or its designee on the date of the closing of the transaction resulting in the change of the beneficial ownership of the Lot or Unit. The payment of the community enhancement fee shall be secured by the Associations charge for Assessments. The following transfers are exempted from the payment of the community enhancement fee:

(a) by a Co-owner to one or more other Co-owners.

(b) by operation of law through succession or the probate of the Owner's estate.

(c) Declarant's Retained Land or any Lot or Unit owned by Declarant

(d) by an Owner to a company, partnership or trust of which the Owner is the sole beneficial owner.

(e) to a lender by virtue of its exercise of its remedy of foreclosure.

(f) Such other Persons as Declarant may exempt from time to time.

The provisions of this Article may not be amended before or after the Turnover Date without the express written consent of Declarant.

ARTICLE XXV
WATER RIGHTS

The Declarant hereby reserves unto itself and its designees, including, but not limited to, the Club all rights to develop and utilize ground water, surface water and storm water runoff within the Community for such purpose as the Declarant may determine in its sole discretion, including the right to distribute such water beyond the boundaries of the Community. By purchasing or occupying a Lot or Unit, each Owner hereby agrees that such right shall include an easement in favour of the Declarant over the Community in order that the Declarant may access, install and maintain any equipment, apparatus or facilities necessary to capture, contain and transport such water.

No Owner shall have a right to claim, develop, capture or utilize any ground water, surface water or storm water within such Owner's Lot or Unit. In addition, no Owner shall have the right to access or utilize the water in any lake, pond, inland waterways or drains.

The Declarant may establish such programs as the Declarant may determine for reclaiming storm water runoff and wastewater for appropriate uses within or outside of the Community. No Owner or occupant of a Lot or Unit shall be entitled to compensation for any storm water claimed or reclaimed from his or her Lot or Unit.

No Owner shall build or erect any structure that may impede, alter or change the flow of any volume of water.

ARTICLE XXVI
GENERAL PROVISIONS

26.1 TERM

The covenants and restrictions of this Master Declaration shall run with and bind the Property, and shall inure to the benefit of and shall be enforceable by Declarant, the Association, the Club or the Owner of any portion of the Property subject to this Master Declaration, their respective legal representatives, heirs, successors, and assigns. Where any provision of this Master Declaration may be subject to the Rule Against Perpetuities, a perpetuity period of 150 years from the date of this Master Declaration shall apply in each and every case, unless a short period of time is required by law in particular circumstances, in which case such shorter period shall apply only in respect to such circumstances.

26.2 AMENDMENT

Until the Turnover Date, Declarant may amend this Master Declaration in its sole and absolute discretion. After the Turnover Date, Declarant may amend this Master Declaration in its sole and absolute discretion at any time and from time to time if such amendment is (i) necessary to bring any provisions hereof into compliance with any applicable governmental statute, rule or regulation, or judicial determination; (ii) necessary to enable any reputable title insurance company to issue title insurance coverage on a Lot; (iii) required by an Institutional Mortgagee or a government mortgage agency or purchaser of mortgage loans, to enable the same to make, insure or purchase mortgage loans on a Lot; (iv) necessary to enable any governmental agency or reputable private insurance company to insure mortgage loans on a Lot subject to this Master Declaration; or (v) correct any stenographic, scrivener's or surveyor's error or any error of a like nature; provided, however, any such amendment shall not adversely affect the title to a Lot unless the Owner thereof shall consent thereto in writing.

After the Turnover Date and so long as it still owns any part of the Property or the Additional Property, Declarant may amend this Master Declaration in its sole and absolute discretion for any other purpose, provided the amendment has no material adverse effect upon the rights of any Owner of a Lot. After the Turnover Date, any Declarant initiated amendment which has a material adverse effect upon the rights of an Owner of a Lot, shall require the affirmative vote (in person or by proxy) or written consent, or any combination thereof, of the Members representing fifty-one percent (51%) of the total votes in the Association and the consent of Declarant so long as Declarant owns any portion of the Property or the Additional Property. For the avoidance of any doubt, the Declarant shall be entitled to vote as a Member for the purpose of attaining the minimum total votes of fifty-one percent (51%).

After the Turnover Date, any non-Declarant initiated amendment which has a material adverse effect upon the rights of an Owner of a Lot, shall require the affirmative vote (in person or by proxy) or written consent, or any combination thereof, of the Members representing seventy-five percent (75%) of the total votes in the Association (other than Declarant), and the consent of Declarant so long as Declarant owns any portion of the Property or the Additional Property.

After the Turnover Date, any non-Declarant initiated amendment which has a non-material adverse effect upon the rights of an Owner of a Lot, shall require the affirmative vote (in person or by proxy) or written consent, or any combination thereof, of the Members representing majority of the total votes in the Association (other than Declarant), and the consent of Declarant so long as Declarant owns any portion of the Property or the Additional Property.

However, the percentage of votes necessary to amend a specific clause shall be not less than the prescribed percentage of affirmative votes required for action to be taken under that clause. No amendment may remove, revoke, or modify any right or privilege of Declarant, the Club or the Albany Yacht Club without the written consent of Declarant, the Club or the Albany Yacht Club, respectively or the assignee of such right or privilege.

26.3 Severability

Invalidation of any one of these covenants or restrictions by judgment or court order shall in no way affect any other provisions, which shall remain in full force and effect.

26.4 Litigation

No judicial or administrative proceeding shall be commenced or prosecuted by the Association unless approved by a vote of seventy-five percent (75%) of the votes eligible to be cast in the Association. This Section shall not apply, however, to (i) actions brought by the Association to enforce the provisions of this Master Declaration, (ii) the imposition and collection of Assessments as provided in Article X hereof, (iii) proceedings involving challenges to ad valorem taxation, or (iv) counterclaims brought by the Association in proceedings instituted against it. In the event any claim is made against Declarant, the Club or the Albany Yacht Club by the Association or any litigation is instituted against Declarant or any of its affiliates by the Association, then the Association shall assess all Members (other than Declarant) for the costs of claim or litigation, including without limitation attorneys' fees incurred, and funds from Common Assessments shall not be used for any such claim or litigation. In any judicial or administrative proceeding, the prevailing party shall be entitled to receive reasonable attorneys' fees and costs.

The decision to pursue enforcement of the provisions of this Master Declaration in any particular case shall be left to the Board's discretion, except that the Board shall not be arbitrary or capricious in taking enforcement action.

26.5 Notice of Transfer of Lot

In the event that any Owner desires to sell or otherwise transfer title of his or her Lot or the beneficial ownership interest therein (including the beneficial ownership interest in the shares or equity of the Owner), such Owner shall give the Board of Directors at least fourteen (14) days' prior written notice of the name and address of the purchaser or transferee, the date on which such transfer of title is to take place, and such other information as the Board of Directors may reasonably require. A nominal administrative fee may be imposed on the transferring Owner upon closing of the sale or transfer or title. The transferring Owner shall remain jointly and severally liable with the transferee for all obligations of the Owner for the Lot, including payment of all Assessments, accruing prior to the date of transfer. Until written notice is received as provided in this Article, the transferring Owner and transferee shall be jointly and severally liable for Assessments accruing subsequent to the date of transfer. In the event that upon the conveyance of a Lot, an Owner fails to reference the imposition of this Master Declaration on the Lot in the deed of conveyance the transferring Owner shall remain liable for Assessments accruing on the Lot after the date of conveyance.

26.6 Use of Words "Albany"

No person shall use the words "Albany" or any derivative thereof in any printed or promotional material without the prior written consent of Declarant. However, Owners may use the term “Albany” in printed or promotional materials where such term is used solely to specify that a particular property is located within the Community.

26.7 Assignment of Rights

Declarant shall have the right, in its sole and absolute discretion, to assign all or part of its rights under this Master Declaration

26.8 Notice of Mortgagee Action

In the event any Owner desires to mortgage his or her Lot, such Owner shall require that the mortgage instrument specifically provide that in the event the mortgagee exercises its right of foreclosure or power of sale, the mortgagee or the Person acquiring the Lot pursuant to the exercise of the mortgagee’s power of sale shall acquire the Lot subject to the Governing Documents.

26.9 No Easement for View

Each Owner further acknowledges that neither Declarant, nor any builder, nor any Person acting on behalf of Declarant or any Sub-developer, has made or is authorized to make, any representation or commitment that any view of the Club Property or any other vistas shall be preserved, protected or remain unobstructed, and there are no express or implied easements for view purposes appurtenant to any Lot.

26.10 Power of Attorney

In addition to the power granted in Section 10.8B hereof, each Owner hereby acknowledges and agree that in consideration of Declarant’s sale of the Lot(s) to such Owner, it, he or she unconditionally and irrevocably appoints the Association and Declarant as its true and lawful attorney-in-fact, coupled with an interest, to execute any and all documents and take any and all actions necessary or desirable to fulfill the purposes and intentions of this Master Declaration.

26.11 Declarant’s Right to Approve Form of Conveyance

Each document purporting to transfer title to any Lot or Unit within Albany shall be submitted to Declarant or its designee for review and approval as to form and content, for the limited purpose set forth in this Article, prior to execution. The purpose of Declarant’s approval rights pursuant to this Article is to maintain a uniform scheme of development for Albany by ensuring that each form of conveyance of a Lot contains the necessary and appropriate terms and provisions to pass the burden of positive (or affirmative) covenants to each subsequent transferee. So long as the document of conveyance accomplishes this objective, Declarant shall not unreasonably withhold its approval of the document. Each selling Owner shall be required to register with the Declarant prior to the Turnover Date and the Association thereafter any change of the beneficial ownership of any Lot or Unit or the beneficial ownership of any shares or equity interest of an Owner of a Lot or Unit. Such selling Owner shall be responsible for all cost incurred in connection with the Declarant’s review and approval under the provisions of this Section 26.11.

26.12 MEMORANDUM OR ARTICLES CONFLICTING WITH MASTER DECLARATION

In the event that the provisions of the Association's Memorandum or Articles conflict with any provisions of this Master Declaration, the provisions of this Master Declaration shall be deemed to prevail.

26.13 NOTICES

a) To Owners or Mortgagees. Except as otherwise provided in this Master Declaration, any notice required to be given to any Owner or Institutional Mortgagee under the provisions of this Master Declaration shall be given by (i) personal delivery; (ii) mail, with proper postage prepaid to the last known address of the recipient; (iii) telephone communication, either directly to the Owner or Institutional Mortgagee or to a person at the Owner's or Institutional Mortgagee's office or home who would reasonably be expected to communicate such notice promptly to the Owner or Institutional Mortgagee; or (iv) facsimile, computer, fiberoptics, or other electronic communication device, with confirmation of transmission to the last known number of the recipient. All such notices shall be given at the Owner's or Institutional Mortgagee's telephone number, fax number, electronic mail address, owner's Unit address or Institutional Mortgagee's business address, or sent to such other address or number which the Owner or Institutional Mortgagee has designated by notice in writing to the Association pursuant to this Section.

(b) <u>To Declarant, Association, Board, or any managing or designated agent.</u> Except as otherwise provided in this Master Declaration, any notice required to be given to Declarant, the Association, the Board, any committee, or managing agent under the provisions of this Master Declaration shall be given by any of the methods described in subsection (a) above, with confirmation of receipt, if applicable, at Declarant's, the Association's, or the managing agent's telephone number, fax number, electronic mail address, registered or principal office, or at such other address or number as shall be designated by notice in writing to the Members pursuant to this Section.

(c) <u>Notice to Co-Owners.</u> Notice to one or two or more co-Owners of a Unit shall constitute notice to all co-Owners.

IN WITNESS WHEREOF the Declarant has caused its Common Seal to be hereunto affixed this ____ day of _________, A.D. 2005.

____

The Common Seal of **PARK RIDGE SECURITIES CORP.** was hereunto affixed by _______________________, President of the said Company, and the said ____________________ subscribed his signature hereto as countersignature to complete the due execution hereof:-

____

JOINDER OF ASSOCIATION

ALBANY COMMUNITY ASSOCIATION, LTD., a Bahamian non-profit company, hereby joins in and consents to the foregoing Master Declaration and hereby agrees to the provisions thereof and the obligations imposed upon the company therein.

IN WITNESS WHEREOF Albany Community Association, Ltd. has caused its Common Seal to be hereunto affixed this ___ day of _____________, A.D. 2005.

____

Name

The Common Seal of **ALBANY COMMUNITY OWNERS ASSOCIATION, LTD.** was hereunto affixed by ________________________, the ____________________ of the said Company and the said ________________________________ affixed his signature hereto as countersignature to complete the due execution hereof.

____

EXHIBIT A
LEGAL DESCRIPTION OF THE PROPERTY

The Property which is subject to this Master Declaration shall refer to the real property legally described as follows, as the same may be supplemented from time to time by a Supplemental Declaration filed in accordance with the Master Declaration:

[INSERT LEGAL DESCRIPTION OF PROPERTY
TO BE SUBJECTED TO EFFECT OF DECLARATION
EXCLUDING THE ADDITIONAL PROPERTY]

EXHIBIT B
LEGAL DESCRIPTION OF THE ADDITIONAL PROPERTY

[INSERT LEGAL DESCRIPTION OF ALL OF THE ADDITIONAL PROPERTY]

APPENDIX IX

REFERENCES

REFERENCES

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