st.
johns
river

OWER
ARK

A Joint Venture of

JEA

FPL

Prepared by: John E. Reid, JEA
Presented by: Kent Zammit, EPRI

Facility Information

- Located in Jacksonville, Florida
- Joint Venture between JEA and FPL
- Plant specific information

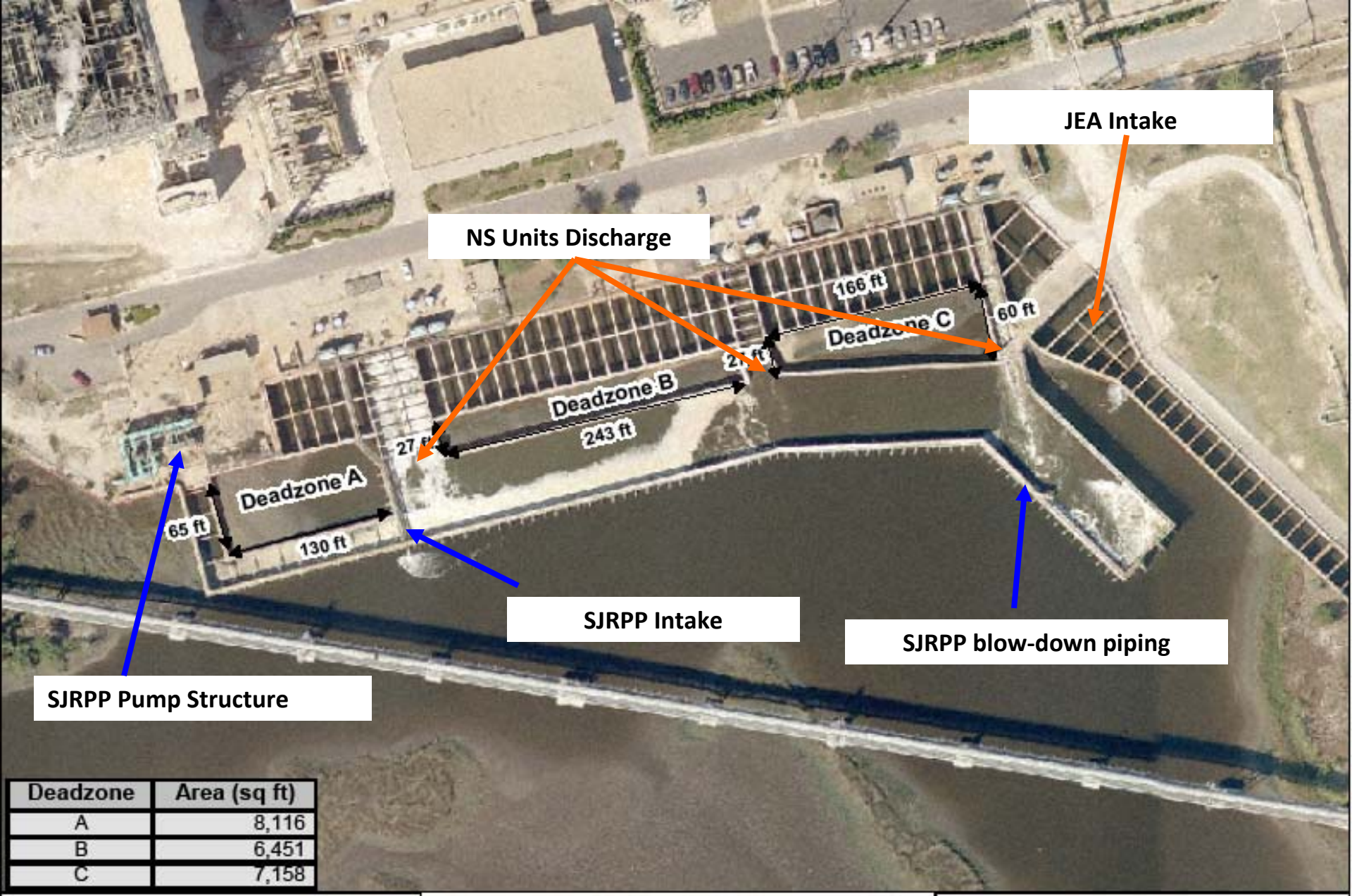
➢Two 650 Mw coal fired units and a water borne coal unloading facility
➢Units went in operation 1986 &1987 respectively
➢Approximately 280 FTE's
➢Foster Wheeler Boilers
➢GE Turbines
➢Wet Scrubbed, electrostatic precipitators, currently constructing SCR's
➢***Utilizes brackish water from the St. Johns River as make up for the circulating water system***


Atlantic Ocean
St Johns River Power Park
Little Talbot Island State Park
New Berlin Rd
Pulaski Rd
N Main St
Eastport Rd
Eastport Rd
Dunn Ave
Leonid Rd
Broward Rd
Trout River Blvd
Riverview
Harbor View
Lake Forest
Lake Forest Manor
Lake Park Estates
Soutel Dr
New Kings Rd
Quinlan
Heckscher Dr
Dames Point Manor
Yellow Bluff Fort
Blount Island Marine Terminal
Dames Point
Huegnot Memorial Park
Mayport Naval Airport
Mayport Naval Station
Fulton
Little Jetties Park
Kathryn Abbey Hanna Park
Panama Park
Pearl Court
Evergreen Cemetery
Brentwood
Talleyrand
Fort Caroline Rd
Gilmore
Mt Pleasant Rd
McCormick Rd
Wonderwood Dr
W 20th St Expy
E 8th St
Haines St
Myrtle Ave N
Edgewood
Rogero Rd
Townsend Blvd
Fort Caroline Rd
Monument Rd
N Kernan Blvd
Girvin Rd
Mayport Rd
Craig Municipal Airport
Atlantic Beach
Jacksonville
N Arlington Rd
Regency Square Mall
Atlantic Blvd
Atlantic Blvd
Neptune Beach
Riverside
Post St
Saint Nicholas
San Pablo Rd
FLORIDA
295
9A
104
5A
105
115
5
95
111
115A
113
117
17
21D
15
139
23
114
109
10
10A
A1A
211
129
228
1
13

Circulating Water System – Operating Information

- Our make up is our sister units circ water discharge
- Their permit discharge temperature 105^{o}F
- Our discharge temperature limit 96^{o}F (24 hr average)
- Our make up rate - approximately 18,000gpm (per tower)
- Evaporation rate - approximately 5,500gpm (per tower)
- Limit on cycles of chlorides concentration discharge - 1.5%
- Limits on blowdown Total Residual Oxidants (TRO) - 0%
    - Operating permit allows us ***ONLY*** chlorine
- Metering points to measure TRO – blowdown pump discharge
- Chlorides content of make-up water – avg. 32,000ppm


SJRPP
JEA NS Units
SJRPP Circ Water Make -UP



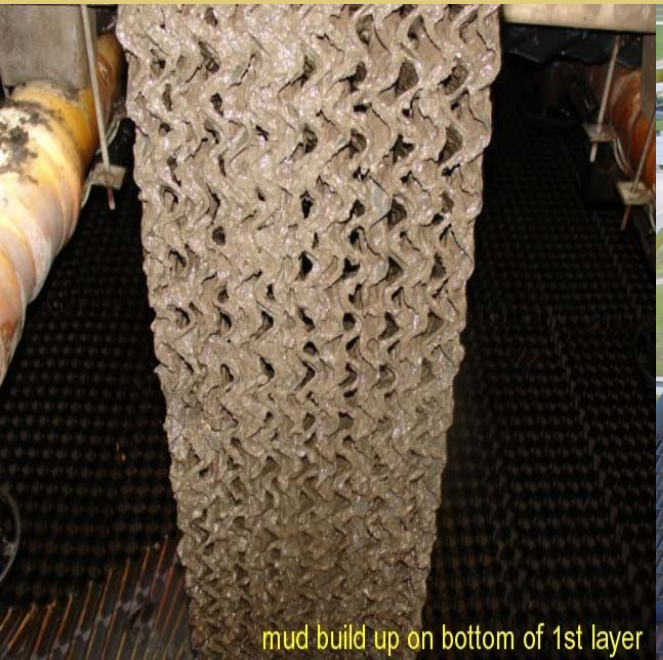
Deadzone	Area (sq ft)
A	8,116
B	6,451
C	7,158

0 50 100 200 Feet

Figure 1
SJRPP Spoil Disposal Areas
JEA

Operating / Maintenance Issues Associated With Salt Water Towers

- Cooling Tower Packing – plugging (bio & mud) impact on thermal performance
- Salt Drift – impact to other plant equipment
- In Concrete Corrosion – loss of concrete and embedded steel



This presentation highlights the impacts of in concrete corrosion

Summary

The cooling towers are approximately 450’ high and 320’ feet in diameter. They are comprised of 4 major ***external*** components.

Veil: 90 “wythes” around the circumference. Each veil is approx. 5’ high and 10’ wide. Concrete ranges in thickness of 3’ at the bottom to 9” at the throat, then back to 3’ at top.

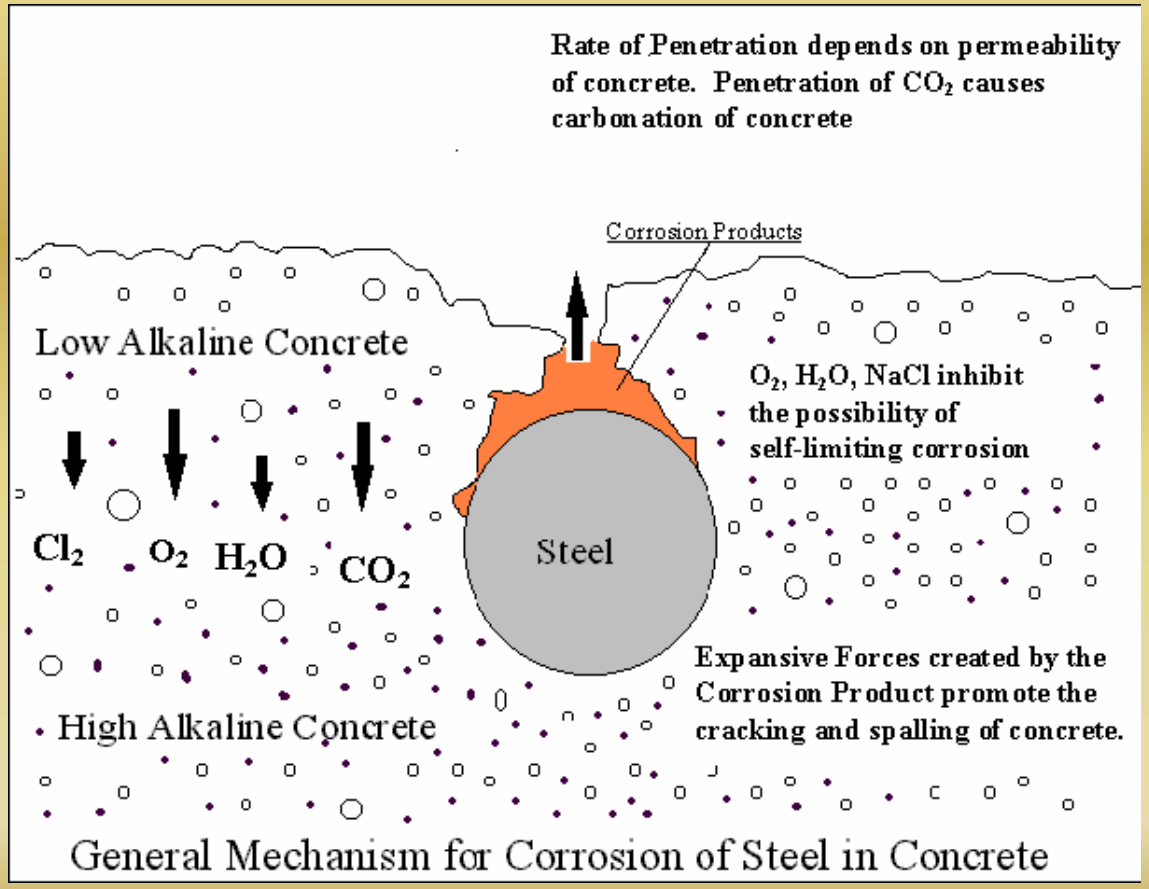
Lintel Beam: 320’ diameter ring at bottom of cooling tower veil.

Columns: 80 concrete #11 steel reinforced, 34” diameter approx. 32’ long.

Piers: 40 arranged in circular pattern; support 2 each diagonal support columns.

This photo is after the lower 60 feet, lintel beams and column legs have been repaired with a sacrificial zinc cathodic protection system

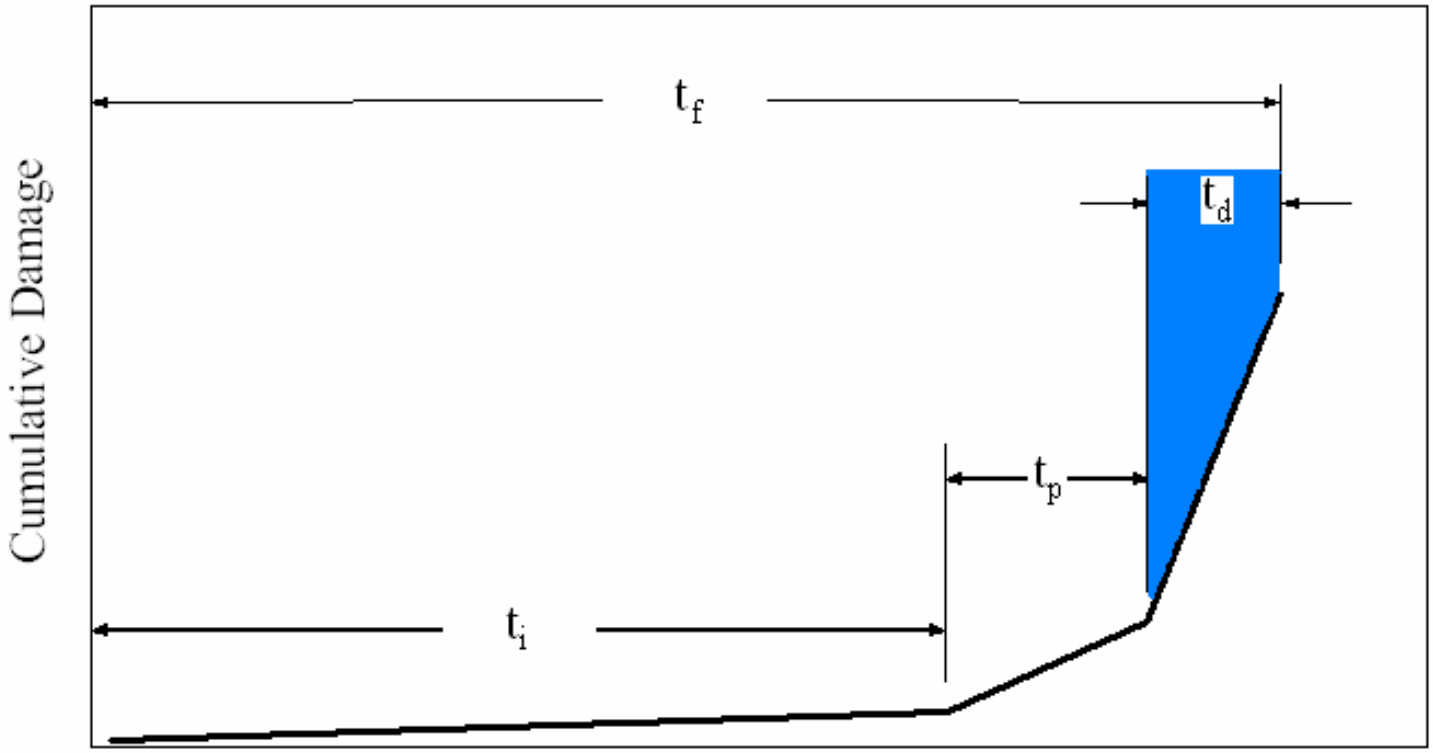
The Corrosion Mechanism



- Chlorides from salt water migrate into the porous Concrete and eventually reach the embedded steel reinforcement.
- Saturation of chlorides in and around the steel will breakdown the naturally occurring passive film that typically protects the steel.

Corrosion of Steel in Concrete

Sequence of Corrosion



Where: T_i is time to initiation

T_p is time to propagation

T_d is time to damage (delamination, spalling, etc.)

T_f is time to failure in service life


Removal of All Loosened
Materials to be complete by
2/28/08


01/27/2008 14:37:11


1200SJP
JLG
GATF

Installation of Zinc Mesh Overlay

To redirect the corrosion from the embedded rebar we selected to install a zinc based sacrificial system called Lifejacket® on the cooling tower Column Legs and Lintel Beam.

Lifejacket® system

This system consists of a zinc mesh and pressure grouted cement system supplement with a sacrificial "bulk" anode.

- Developed in mid-'90's through close involvement with FDOT*
- Primary niche market: galvanic cathodic protection in marine environment on steel reinforced concrete structure
- Has been installed in 6 states and 8 countries totaling over 4000 installations
- Patented in 1998; registered Trademark

* Florida Department of Transportation

Cathodic Protection – Lifejacket® system

"Cast in Place Zinc Mesh" Concept

- FRP jacket is used as a concrete form for pile rehabilitation.
- Nylon bolt standoffs affix the zinc anode mesh to the FRP and provide the precise annular space.
- The anode wires are soldered in place and coated with epoxy.
- Typically installed as dual anode system: mesh + bulk.

Embedded Zinc Mesh In Veil

Lifejacket System on Lintel Beam & Columns

Structural Integrity – Lessons Learned

We believe the original construction specification fell well short of addressing the environment these towers were to be subjected.

Accordingly, if we were having these towers designed today…

- concrete specification would require a dense mix - additives
- a cathodic protection system protecting all layers of steel would be mandatory
- tower internals, hangers & rods, nozzle retaining bands etc…would all be of high grade alloy instead of fiberglass

Operations and Maintenance – Lessons Learned

- Permit restrictions on types of biocides/algaecides & TRO of discharge metering point should have been negotiated more vigorously with state and county agencies.
- More emphasis on the importance of a solids removal process of cooling tower make-up water system.
- An above the packing quadrant chemical injection system to fight bio-growth on packing would be a given.
- Packing and drift eliminator support systems; ease of access for both as well as distribution header nozzles should be a priority.