Packery Channel,
Baseline Physical Process Monitoring
Overview and Status

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October 17, 2006

May 06, before north jetty completion

2. Dec 03- Ap 04. Dredged and placed 110,000 cu yd of sand along southern shoreline to Whitecap (end of seawall).


4. Aug-Sep 05. Storm surge associated with Rita and Katrina impacted area.

5. Jul-Dec 05. Narrow channel remains open.

6. Jan-Feb 06. Dredging of channel, partial placement at south end of seawall.

7. Mar 06. S. Jetty complete to 1,400 ft.

8. Oct 06. N. Jetty complete to 1,400 ft.
Overview of Presentation

1. Packery Channel design overview
2. Monitoring program, example results
3. Key findings from monitoring to date
4. Preliminary modeling
5. Comments to City

Acknowledgement: Almost all aerial photographs shown in this presentation were taken by Lanmon Aerial Photography, Inc., Corpus Christi, Texas
1. Packery Channel Design

- Documented in Kraus & Heilman (1997) and in Brown & Militello (1997)
  http://goliath.cbi.tamucc.edu/TexasInletsOnline/
## Packery Channel Design

### Comparison of Selected Inlets along Texas Coast

**Table 3.** Approximate geometry of five Texas Gulf Coast passes.

<table>
<thead>
<tr>
<th>Pass</th>
<th>Jetty Length, ft (perpendicular to shoreline)</th>
<th>Estimated Depth at Jetty Tip, ft</th>
<th>Distance Between Jetties, ft</th>
<th>Depth of Entrance Channel, ft</th>
<th>Width to Depth Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado River</td>
<td>East Jetty: 1,400, West Jetty: 600</td>
<td>13</td>
<td>1,300</td>
<td>16</td>
<td>81</td>
</tr>
<tr>
<td>Aransas Pass</td>
<td>North Jetty: 11,000, South Jetty: 9,000</td>
<td>30</td>
<td>1,300</td>
<td>47</td>
<td>28</td>
</tr>
<tr>
<td>Fish Pass</td>
<td>870</td>
<td>8</td>
<td>400</td>
<td>8, 4(9)</td>
<td>50, 100</td>
</tr>
<tr>
<td><strong>Packery Channel</strong></td>
<td><strong>1,400</strong></td>
<td><strong>11</strong></td>
<td><strong>300</strong></td>
<td><strong>11</strong></td>
<td><strong>27</strong></td>
</tr>
<tr>
<td><strong>(Proposed)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mansfield Pass</td>
<td>1,350(10)</td>
<td>15</td>
<td>1,000</td>
<td>16</td>
<td>63</td>
</tr>
</tbody>
</table>
Packery Channel expected to be stable, relatively easy to maintain, and cause moderate shoreline change because:

1. A historic hurricane overwash pass and historic entrance to Corpus Christi Bay.
2. Designed to have low jetty width to channel depth ratio (hydraulically efficient).
3. Located in Gulf of Mexico near zero net littoral sand drift.
4. Located in southeast corner of bay; benefits from current produced by wind fronts from north.
2. Monitoring Program

Supported by Corps Galveston District for 3 years @ ~ $200,000/year 
Augmented by the Corps’ national Coastal Inlets Research Program

1. Survey Nearshore and Channel
   • Beach profile
   • Shoreline position
   • Ebb shoal
   • Channel
   • Sediment grain-size analysis

2. Measure Current and Numerically Model Circulation
   • Packery Channel
   • GIWW at JFK
   • Begin numerical model development

3. Obtain and Interpret Aerial Photography

4. Manage and Disseminate Data
   Texas Inlets Online (all data posted – publicly available)
Ebb Shoal Survey 29 Jul 05

1. One week after Hurricane Emily forced Packery Channel open.

2. South jetty ≈ 75% complete and north jetty ≈ 50% complete at that time.

3. Inner Channel depths 12-13 ft NAVD88 (MSL=+0.48 ft).

4. Storm surge opened the channel mouth, producing channel mouth depths of 4-8 ft NAVD88.

5. Depths at projected jetty length are 12-13 ft NAVD88.
29 Jul 05
Almost Pre-Construction

Approximate jetty Position
29 Jul 05

Tip of jetty upon completion
Scour, no ebb shoal
31 Aug 06 – close-up

Jetty Tip Shoal?

Still no ebb shoal; Reduced scour

Outer bar migration toward entrance

Inner Channel depths 12 to 13 ft NAVD88 (MSL=+0.48 ft).

Channel shoaling (< 7 ft NAVD88) adjacent to jetties.
Key Findings from Monitoring

Ebb Shoal

1. At present, no ebb shoal.

2. Channel shoaling between jetties is restricted to central section along north and south jetties.

3. Channel shoaling between jetties increased by incomplete northern jetty and landward gap in armoring.

4. Depth at inlet mouth increased from Jul 05 to Mar 06 and then began to decrease through Aug 06. Depths are approaching those observed in the baseline survey.
Beach Profile Surveys
(Also, available from 1970s & 1996)

1. Slight accretion adjacent to jetties by impoundment.
2. Accretion along seawall by placement.
3. Minimal change at northern and southern extremes.
4. Some sustained post-storm erosion in small region north of inlet (PC11).
Beach Profile Survey
South end of Newport Pass (north of inlet)

1. Minimal change in berm and beach width observed north (Newport Pass to Fish Pass) and south (just south of seawall to Nueces Kleberg County Line) of the inlet.

2. Typically three sand bars.

3. Depth of Closure 16-20 ft NAVD88.
1. Net accretion maintained from BD1 (adjacent to south jetty) south to PC06 (south end of seawall).

2. Some erosion observed during active hurricane season from Jul to Sep 05.
Beach Profile Survey
Mid-way between north jetty & Newport Pass

1. Accretion from Aug 03 to Jul 04.

2. Some erosion observed during active hurricane season (Jul to Sep 05).
Shoreline Position

1. Shoreline position change dynamic adjacent to inlet and in front of seawall.

2. Shoreline defined as berm crest (1.5-2 ft NAVD88).

1. Shoreline position change decreases within 1/2 mile of inlet to the north and south.

2. Shoreline advancing within dynamic region adjacent to the inlet.
1. Shoreline advance adjacent to jetties:
   \[ \approx 380 \text{ ft on north side} \]
   \[ > 400 \text{ ft on south side} \]
   (15 Aug 03 survey as baseline)

2. South side shows gradual advance over time.

3. North side more erratic prior to Jul 06 due to losses sustained through gap in north jetty during storm surges.
1. Shoreline advance on the order of 60 ft (south end) to -200 ft (north end) in front of the seawall as of 07/19/2006.

2. Post-Hurricane Emily survey (29 Jul 06)

3. Active period of sand placement (4 Jan 06 -- yellow line)
Current in Packery Channel

Measurements

1. Real-time measurement of current speed and direction.
2. Online access to current data.
3. GIWW and in Channel

JFK150
Center of GIWW under the JFK Bridge

PC138
North of HWY 361 Bridge
1. Tidal signal is strong.

2. Ebb flow is enhanced by strong W and NW wind during frontal passage.

3. Flood flow is enhanced by strong ESE winds which dominate in the region, so current is flood biased.

4. Values in range predicted in the 1997 report.
Current
Last week, plotted on web site

http://lighthouse.tamucc.edu/qc/138/today,-7d/
Key Findings from Monitoring

Current Record  PC138
Sep 05 to May 06

1. Max. flood velocity = 1.6 m/s.
   Avg. flood velocity = 0.36 m/s

2. Max ebb velocity = 1 m/s
   Avg. ebb velocity = 0.39 m/s


4. Agreement with model predictions:
   1.0 m/s during typical conditions
   1.5 m/s during storms
   (Brown and Militello 1997)
New Numerical Model of Circulation and Sand Transport by Tide, Waves, and Wind
Numerical Model, Initial Tests

PC138 Current Comparison

V, m/s

01/02  01/05  01/08  01/11  01/14  01/17  01/20

Date, 2006

M2D
Observed
Numerical Model – Initial Tests

PC138 Current Comparison

V, m/s

Date, 2006
Preliminary Exploration of Circulation on Mollie Beattie Coastal Habitat Community, **Mild Wind, With Channel**

- Wind from north at 3 m/s
- Mild winter wind
- Flushing of flats during ebb and flood flow

Path of velocity field

Wetted area of Mollie Beattie
Without Packery Channel, Mild Wind

Flow does not exit flats during mild wind.
• During strong wind ~ 14 m/s blowing from north

• Winter condition during strong northeasters

• Model shows flushing of flats during ebb and flood flow
Without Packery Channel, Strong Wind

- During north wind with velocity of ~ 14 m/s
- Without inlet, flushing of flats is seen only during strong wind
Comments to City

- Continue monitoring – to allow “adaptive management”
- Expect to dredge every 1 to 2 years.
- Place dredged sand on “downdrift” beaches (might vary seasonally).
- Do not allow shoreline next to jetties to advance too much (dredge first) to avoid channel sanding in.
- Be careful to reduce sand entering channel by wind.
- Current will not be strong, promoting safer navigation.
- GIWW not expected to experience extra sand infiltration by presence of Packery Channel.