Abstract

The NJDOT Office of Maritime Resources is looking to better assess the use and economic value of New Jersey’s 214 marine channels and waterways in order to prioritize future investments in dredging and other related maintenance activities. This research developed and tests a methodology to count and classify vessels on New Jersey’s Marine Transportation System.
Purpose

Development of a better understanding of New Jersey’s marine channels

» How should dredging investments be applied?
» How is marine traffic affected by different variables?
» Can existing marine channels safely accommodate existing boating traffic?

Development of a comprehensive marine asset management system
# Evaluation of Vessel Count Methodologies

<table>
<thead>
<tr>
<th>Count Methodology</th>
<th>Manual Observation</th>
<th>Manual with Still Photo</th>
<th>Video</th>
<th>Aerial Photography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic data (volume, direction, time of day)</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Origin-Destination information</td>
<td>Direction Only</td>
<td>Direction Only</td>
<td>Direction Only (for ground-based video)</td>
<td>Full O-D Data (see note)</td>
</tr>
<tr>
<td>Classification data</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Cost of field data collection</td>
<td>Between video and aerial</td>
<td>Between video and aerial</td>
<td>Lowest</td>
<td>Highest</td>
</tr>
<tr>
<td>Post-Processing Required</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ability to save raw data and use QA/QC to compensate for human error</td>
<td>Data collection depends on accurate entry; no ability to review or verify counts</td>
<td>Classification can be verified by reviewing photos, but photos must be taken and images must be clear</td>
<td>With archived video, both count and classification data can be reviewed and verified</td>
<td>Archived aerial photos can be reviewed and count data verified</td>
</tr>
<tr>
<td>Ability to archive data</td>
<td>(counts only)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
# Manual Count Testing

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoreline accessible</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sight distance 0 – 300 feet</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>No/low wake zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoreline accessible</td>
<td>✓</td>
<td>Limited (dependent on resolution of digital photos)</td>
<td>Limited (difficult to capture vessel information on fast-moving vessels)</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Sight distance 0 – 300 feet</td>
<td>✓</td>
<td>Limited (dependent on resolution of digital photos)</td>
<td>Limited (difficult to capture vessel information on fast-moving vessels)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium/ high wake zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoreline accessible</td>
<td>✓</td>
<td>Manual class data only</td>
<td>Limited (vessel information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sight distance &gt; 300 feet</td>
<td>✓</td>
<td>with binoculars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varying wake zones</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoreline not accessible</td>
<td>✓</td>
<td>✓ from boat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited or no sight distance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Vessel Classification Scheme

Consideration of U.S. Coast Guard, NJ Motor Vehicle Commission, and National Marine Manufacturer’s Association

A classification scheme should be easily observable to a trained observer

- Personal Watercraft
- Small Motorboat
- Large Motorboat
- Large Fishing Boat
- Small Sailboat
- Medium Sailboat
- Large Sailboat
1) Personal Watercraft
2) Small Motorboat
3) Large Motorboat
4) Large Fishing Boat
5) Small Sailboat
6) Medium Sailboat
7) Large Sailboat
Procedure

- Preparation of pilot data collection
- Site visit and research
- Methodology testing
- Coordination with local officials
- Staff training
- Implementation
Procedure Implementation

- Implementation of procedure across multiple field conditions

Gunner’s Ditch (Wide Waterway)  Schellenger’s Creek (Narrow Waterway)
## Development of Project Waterway Classification System

<table>
<thead>
<tr>
<th>Waterway</th>
<th>Classification</th>
<th>Waterway Width (in feet)</th>
<th>Average Daily Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toms River</td>
<td>1 (1,000 Feet + )</td>
<td>4,975</td>
<td>1,106</td>
</tr>
<tr>
<td>Metedeconk River</td>
<td>1</td>
<td>2,175</td>
<td>1,376</td>
</tr>
<tr>
<td>Oceanport Creek</td>
<td>1</td>
<td>1,175</td>
<td>141</td>
</tr>
<tr>
<td>Gunner’s Ditch ICW</td>
<td>2 (400 Feet – 1,000 Feet)</td>
<td>741</td>
<td>246</td>
</tr>
<tr>
<td>Liberty Thorofare</td>
<td>2</td>
<td>635</td>
<td>273</td>
</tr>
<tr>
<td>Gunner’s Ditch</td>
<td>2</td>
<td>456</td>
<td>1,212</td>
</tr>
<tr>
<td>Long Reach Thorofare</td>
<td>2</td>
<td>410</td>
<td>79</td>
</tr>
<tr>
<td>Tuckerton Creek Channel</td>
<td>3 (200 – 400 Feet)</td>
<td>335</td>
<td>133</td>
</tr>
<tr>
<td>Manasquan River</td>
<td>3</td>
<td>325</td>
<td>227</td>
</tr>
<tr>
<td>Schellenger’s Creek</td>
<td>3</td>
<td>291</td>
<td>227</td>
</tr>
<tr>
<td>Double Creek Mainland North</td>
<td>3</td>
<td>225</td>
<td>178</td>
</tr>
<tr>
<td>High Bar Harbor</td>
<td>3</td>
<td>215</td>
<td>321</td>
</tr>
<tr>
<td>Point Pleasant Canal</td>
<td>4 ( &lt; 200 Feet)</td>
<td>175</td>
<td>200</td>
</tr>
<tr>
<td>Double Creek Mainland South</td>
<td>4</td>
<td>175</td>
<td>163</td>
</tr>
<tr>
<td>St. George’s Thorofare</td>
<td>4</td>
<td>130</td>
<td>303</td>
</tr>
</tbody>
</table>
**Holiday vs Non-Holiday Waterway Usage**

- **Daily Total Volumes**
  - Waterway: Gunner's Ditch, Manasquan River, Double Creek North of Launch, Manasquan River Canal, St. George's Thorofare, Tuckerton Creek, Ocean, Port Creek, Long Reach, Schellenger Creek
  - Dates and Volumes:
    - Memorial Day Weekend Saturday 5/28/2016, Saturday 6/18/2016, Saturday 8/26/2017, Friday 9/1/2017
    - 4th of July Weekend Saturday 7/2/2016
    - Labor Day Weekend Friday 9/1/2017

- **Graph Legend**:
  - Saturday 8/17/2013
  - Saturday 8/18/2016
  - Saturday 8/26/2017
  - Friday 8/25/2017
  - Saturday 9/9/2017
  - Friday 9/8/2017

**Note:** The graph shows comparative waterway usage data for different dates, highlighting the impact of holiday periods on waterway demand.
Preliminary Takeaways

- All 4 methods of vessel counting yielded similar results (within 3.2%)

- Only ground-based counts are able to produce reliable vessel classification data at a reasonable cost

- Location and selection of suitable vantage point must be considered to accurately determine volume and classification

- Additional counts would be needed to test the methodologies
Temporal Breakdown of Marine Traffic

![Graph showing temporal breakdown of marine traffic across various waterways and time of day.](image-url)
Analysis of Marine Traffic – Narrow Waterway (Point Pleasant Canal)
Analysis of Marine Traffic – Wide Waterway (Gunner’s Ditch)

![Graph showing analysis of marine traffic over time with different vessel types and dates.]

- **Small Motor boat**
- **Medium Motor boat**
- **Large Motor boat**
- **Small Sailboat**
- **Medium Sailboat**
- **Large Sailboat**
- **Personal Water Craft Non-Motorized**
- **Personal Water Craft Motorized**

**Time of Day**
- 6:00 AM
- 7:00 AM
- 8:00 AM
- 9:00 AM
- 10:00 AM
- 11:00 AM
- 12:00 PM
- 1:00 PM
- 2:00 PM
- 3:00 PM
- 4:00 PM
- 5:00 PM
- 6:00 PM
- 7:00 PM

**Dates:***
- Saturday 8/17/2013
- Saturday 6/18/2016
- Saturday 7/2/2016
- Saturday 5/27/2017
- Saturday 5/28/2016
- Friday 8/25/2017
- Saturday 8/26/2017

**Total Number of Vessels**
- 0
- 20
- 40
- 60
- 80
- 100
- 120
- 140
- 160
- 180
- 200
- 220

**Total Number of Vessels**
- 0
- 200
- 400
- 600
- 800
- 1000
- 1200
Establishing a Formal Data Collection Plan

- Phase 1: Sorting of all 214 New Jersey channels and waterways into classification system
- Phase 2: Development of a waterway counting plan
- Phase 3: Preparation & logistical arrangements for field data collection
- Phase 4: Data collection
- Phase 5: Post-processing
Future Steps for NJDOT

- Adoption and implementation of formalized count procedures and classification systems
- Data-driven decision making from additional counts
  - Regression analysis of different variables (weather, channel width, channel depth, vertical clearance, population demographics, temporal, tides)
  - Year-over-year trends
- Development of a formalized marine asset management system
Any questions

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