

Route 71 over Shark River

Road Diet & Safety Improvements



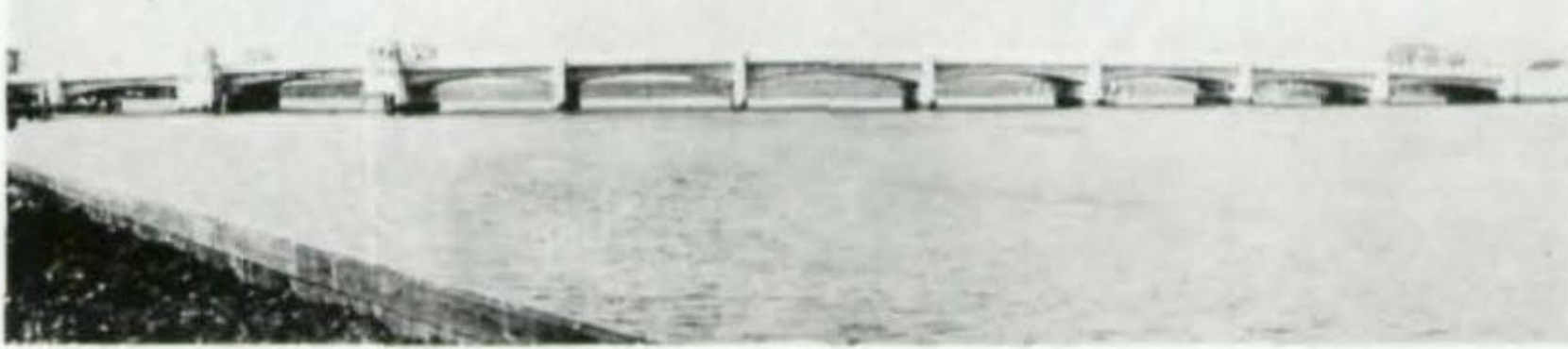
Gerald P. Oliveto, P.E.
September 2023





Route 71 over
Shark River

- **Spans Avon-By-The-Sea and Belmar**
- **Double leaf bascule drawbridge**
- **Constructed 1932**
- **Construction Cost: \$413,320.45**



FIRST PLACE—CLASS B—1933 AWARD

SHARK RIVER BRIDGE—Between F St., Belmar, and Main St., Avon, N. J.; Total Cost, \$413,320.45; Engineer, Morris Goodkind. Bridge Engineer, State of New Jersey, State Highway Commission; Fabricators, American Bridge Company; Owner, State of New Jersey Highway Commission; Completed October 12, 1933; Spans: 9 spans, 83 ft., plus 1 bascule span, 110 ft.—total length, 853 ft.



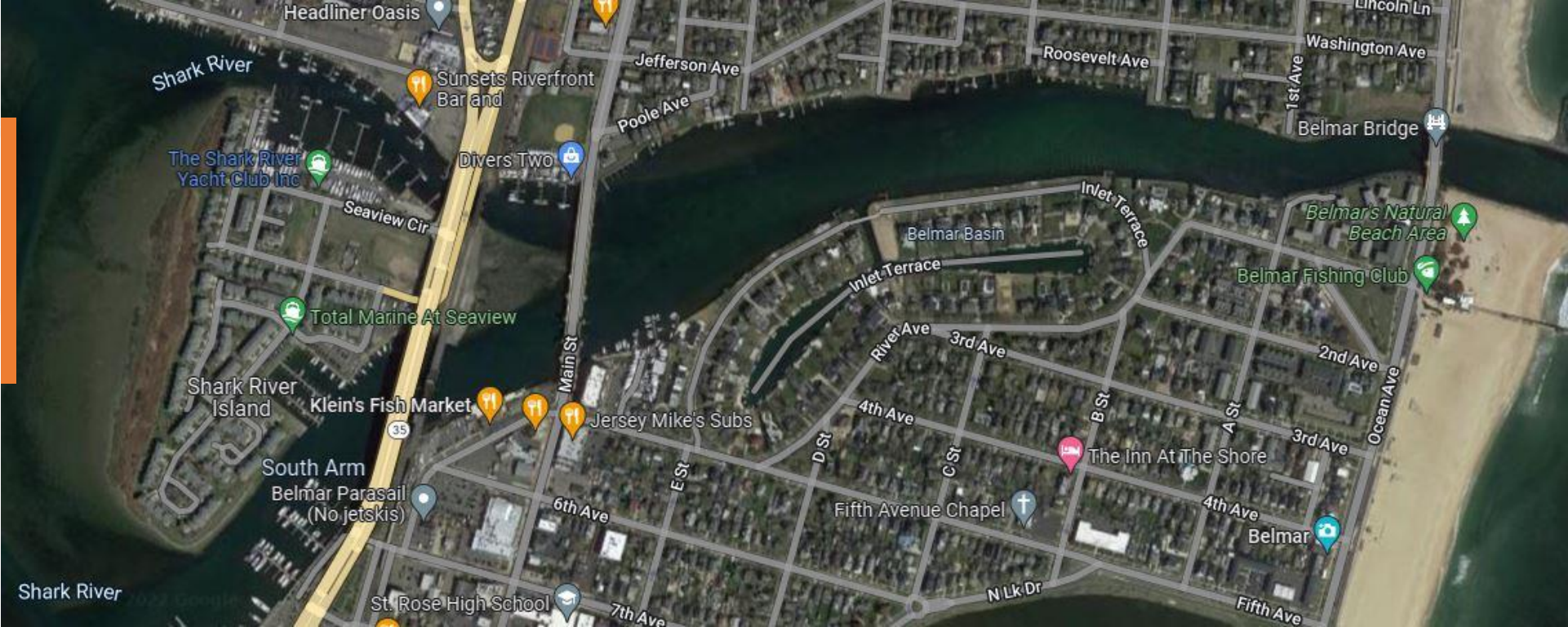
Route 71 over Shark River

- **Awarded the 1933 “Most Beautiful Bridge Award” by American Institute of Steel Construction**
- **Listed on National Register of Historic Places**

Route 71 over Shark River

- **NJDOT's busiest drawbridge**
- **Over 5,000 marine openings annually**
- **Staffed 24/7**
- **Seasonal vehicular traffic**
- **Heavy pedestrian and bicycle traffic year-round**





Route 71 over Shark River

- **Second bridge of four bridges from Atlantic Ocean**
- **Offers 13 feet of clearance in closed position**
- **Ocean Avenue (15 ft closed)**
- **NJ Transit (8 ft closed)**
- **NJ Route 35 (50 ft fixed clearance since 2004)**



Route 71 Safety Features

- **Bridge traffic signals**
- **Pre-Empted traffic signals**
- **Warning Gongs**
- **Warning Gates**
- **Barrier Gates**
- **Span Locks**

Route 71 Safety Features

- **Green square = bridge traffic signal, warning gongs**
- **Yellow = warning gates**
- **Red = barrier gates**
- **Blue = span locks**



Route 71 Opening Sequence

- **Marine call to bridge house via radio or telephone**
- **Operator monitors cameras, turns traffic signals to red when safe (flashing lights, gongs activated)**
- **Operator ensures all traffic is stopped, clear of gates**
- **Warning gates lowered**
- **Barrier gates lowered (oncoming, offgoing)**
- **Span locks disengaged**
- **Horn sounded (2 long)**
- **Bridge raised**

Route 71 Closing Sequence

- **Vessel captain notifies bridge house that vessel is clear of bridge**
- **Operator ensures marine traffic is clear of bridge**
- **Horn sounded (5 short)**
- **Bridge lowered**
- **Span locks engaged**
- **Barrier gates raised (offgoing, oncoming)**
- **Warning gates raised**
- **Operator turns traffic signals to green**
- **Sequence takes 7 minutes (red light to green light)**



Span Lock Failure

September 22, 2021

- **Bridge equipped with three span locks for safe operation – Deck configured for 3 lanes**
- **Center span lock failed during third lift of the morning**
- **Weather conditions were partly cloudy, 70 degrees**
- **No previous significant events with span locks**



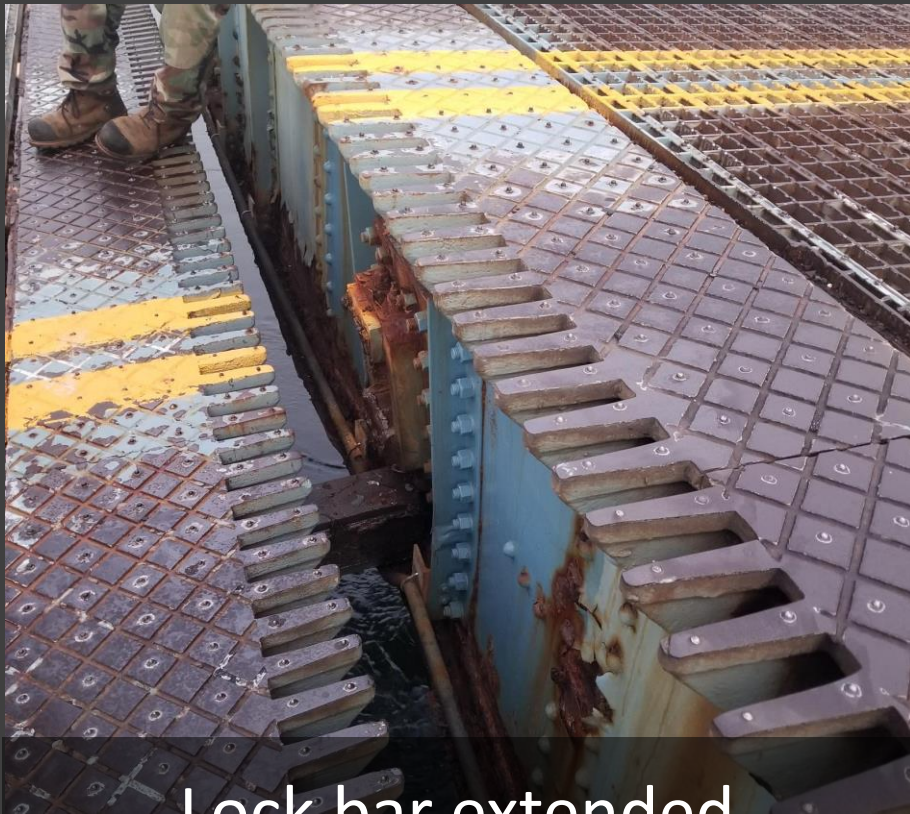
Span Lock Failure

September 22, 2021

- **Center span lock bar engaged while bridge was raised**
- **No indications on Operator's control panel**
- **Operator initiated closing sequence as usual**
- **Bridge could not close with lock bar engaged**

Span Lock Failure

September 22, 2021



Lock bar extended



Damaged receiver socket
and bent south floor beam

Span Lock Failure

September 22, 2021



Bent toe (south) floor beam



Bent flange and web,
misaligned receiver

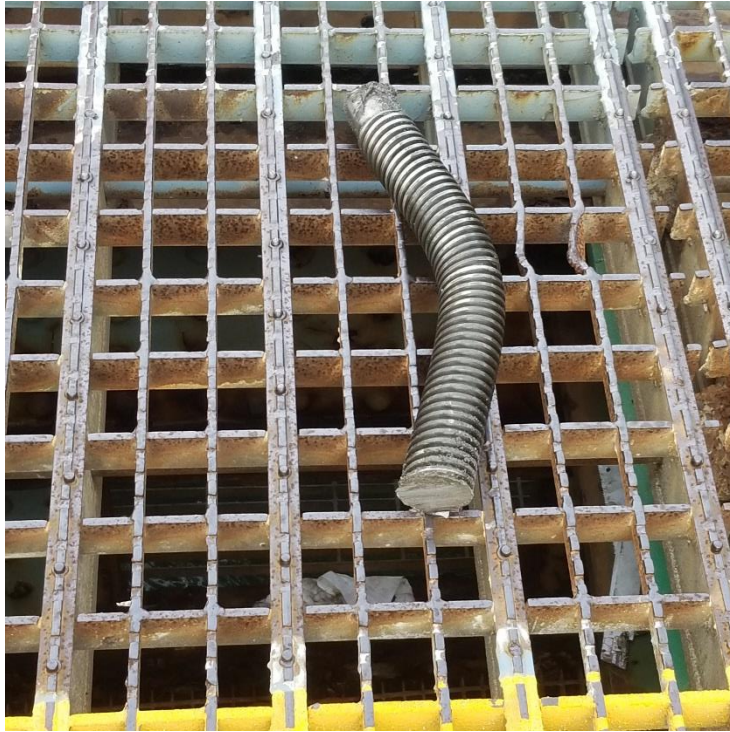


Span Lock
Failure –
Emergency
Response

- **US Coast Guard notified – bridge inoperable**
- **Local Police notified – Route 71 shut down**
- **NJDOT Crews implemented detour**
- **Public alerted via 511, VMS Boards, Social Media**
- **Boats at sea notified via marine radio**
- **NJDOT and WSP engineers on site**

Span Lock Failure

Emergency Response



Damaged span lock driving gear

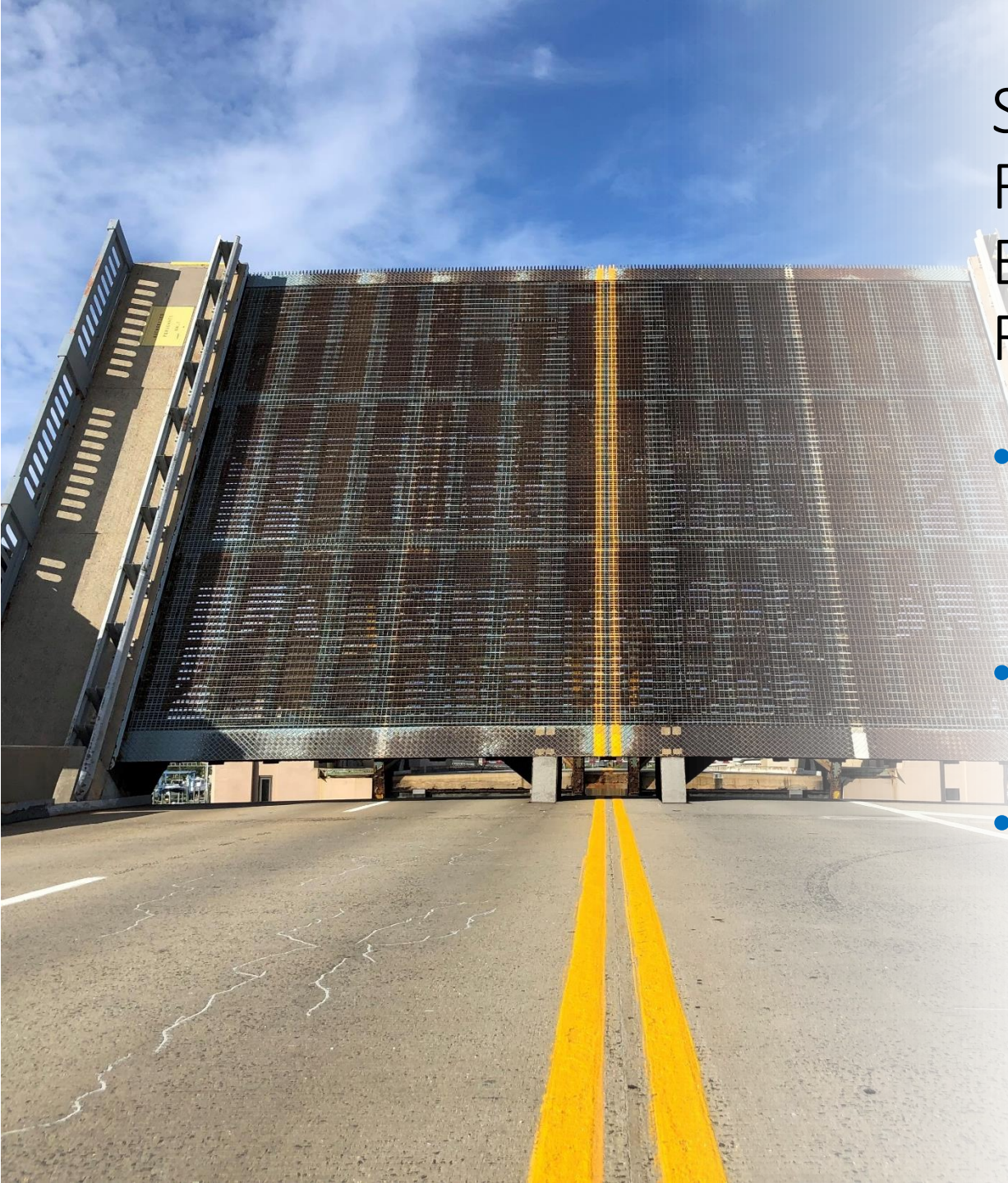
- **On-Call Contractor on-scene**
- **Center span lock not reusable**
- **Damaged span lock hardware cut and removed**
- **Center span lock electric bypassed**
- **Allowed NJDOT to raise bridge to remove all damaged components**

Span Lock Failure Emergency Response



Control Console

- **Movable Bridge Engineering & DOT's On-call electrical contractor on-scene**
- **Operator's panel configured to allow operation with remaining two span locks**
- **Programming revised to prevent similar malfunction**



Span Lock Failure – Emergency Response

- **Bridge opened to marine traffic same day**
- **Boats at sea able to return**
- **Span left open to marine traffic, closed to roadway traffic**



Span Lock Failure Cause & Response

- **Failed proximity switch quickly identified**
- **False indication that span was lowered when it was not**
- **Span lock engaged improperly**
- **All proximity switches from that batch replaced statewide**
- **Bridge evaluated for operation with remaining two span locks**



Span Lock Failure Bridge Re-Opening

- **Pressure from towns to re-open to traffic (Shoulder Season)**
- **Bridge opened to one lane each direction September 24, 2021**
- **Safety interlock testing performed with center span lock removed**



Route 71 Long Term Plan

- **Plan needed for remaining life of bridge**
- **Bridge programmed for replacement in near-future, cost/benefit analysis prepared**
- **Interim repair options studied:**
 - **Option 1 – No Changes**
 - **Option 2 – Replace Center Span Lock**
 - **Option 3 – Road Diet Across Structure**

Option 1: Maintain Structure in Existing Condition

- **Lowest up-front cost**
- **Bridge remains open to traffic**
- **Increased fatigue in structural steel**
- **Premature and uneven wearing of bridge machinery**
- **Any failure would cause imminent closure of bridge**
- **Concern with three heavy vehicles crossing bridge simultaneously**
- **Need to avoid potential load-posting of bridge**



Option 2: Restore Structure to Pre-Failure Condition

- **Highest cost option, repairs begin at \$3.5 million**
- **Most complex option**
- **Structural steel design, fabrication, and installation (COVID production delays, lead times)**
- **New span lock custom design, fabrication, and installation**
- **Internal access system, electrical system design, fabrication, and installation**
- **Extended roadway & sidewalk closures**
- **Prolonged detours, minimum six months**
- **Extended marine outages**
- **Balancing implications with steel removal and replacement**
- **General concerns performing such extensive repairs on a 1932 drawbridge**

Option 3: Reduce Lane Configuration (Road Diet)

- Reduces roadway to one lane in each direction (previously 2 southbound, 1 northbound)
- Low cost solution
- Quick implementation
- Properly balance traffic load on outside two span locks
- No live load additional stress on damaged structural steel
- Preserve remaining lifespan of structure (estimated 8-10 years)
- 50 ft wide deck allowed option for bicycle traffic



Option	Option 1: Maintain Structure	Option 2: Restore Structure	Option 3: Road Diet
Initial Cost	\$0	\$3.6 million	\$150,000
Annual Cost	\$1 million	\$36,000	\$36,000
Benefit	\$36,000	\$4.1 million	\$7.9 million
Benefit Ratio	0.036	1.14	52.7

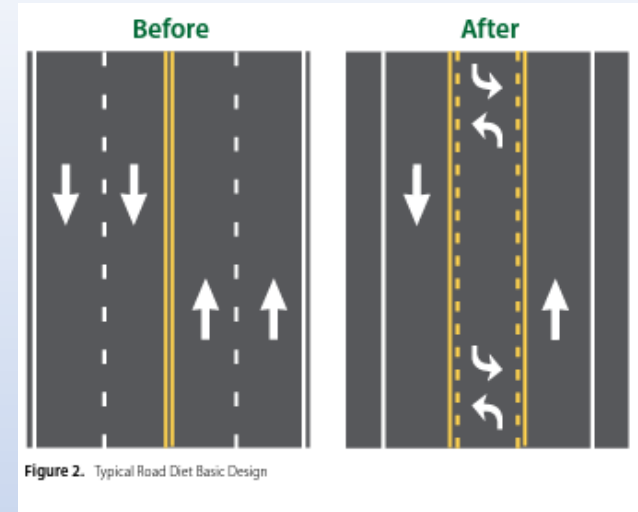
Long Term Plan – Cost Benefit Analysis

- **Three options analyzed**
- **Initial repair costs compared to future emergency repairs**
- **Economic impact of Options 1 and 2**
- **Option 3 – Road Diet clear path forward**

Route 71 Road Diet Design

What Is A Road Diet?

- FHWA: “Removing travel lanes from a roadway and utilizing the space for other uses and travel modes”
- Create improved quality of life along a corridor
- Low cost solution to increased multimodal safety
- Reduction in overall crashes
- Provide more space on roadway for bicycles, pedestrians
- Reduction in traffic speeds





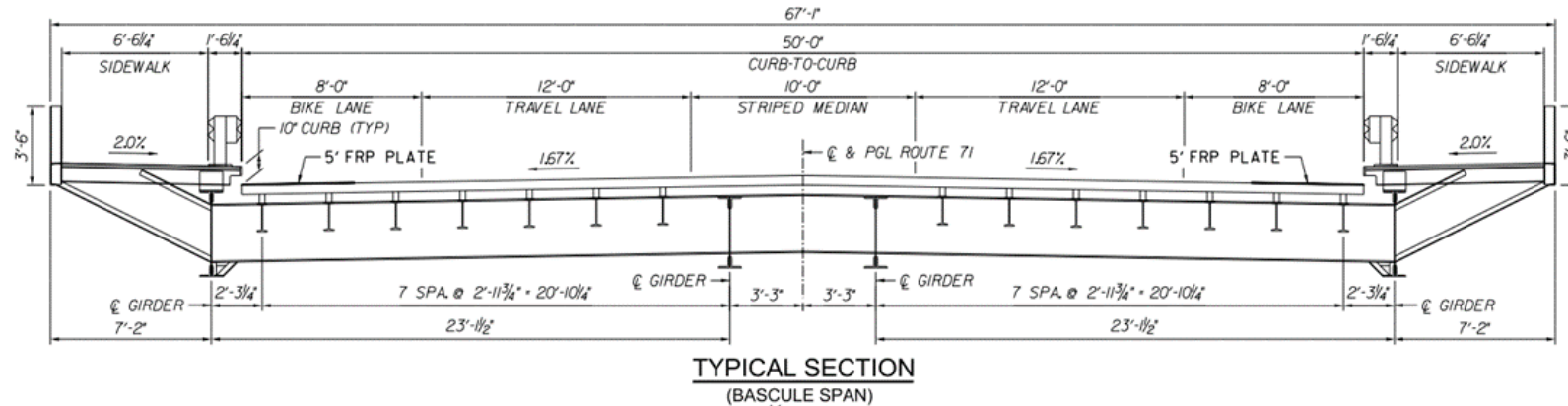
Route 71 Road Diet Design

- Route 71 historically 4 lane highway with double yellow, limited parking
- 2004 “Streetscape” coordinated with Route 35 fixed bridge construction
- Route 71 reduced to one lane each direction through Avon-By-the-Sea
- Dedicated left turn lanes, bike lanes, parking
- Route 35 became arterial, Route 71 Main St.



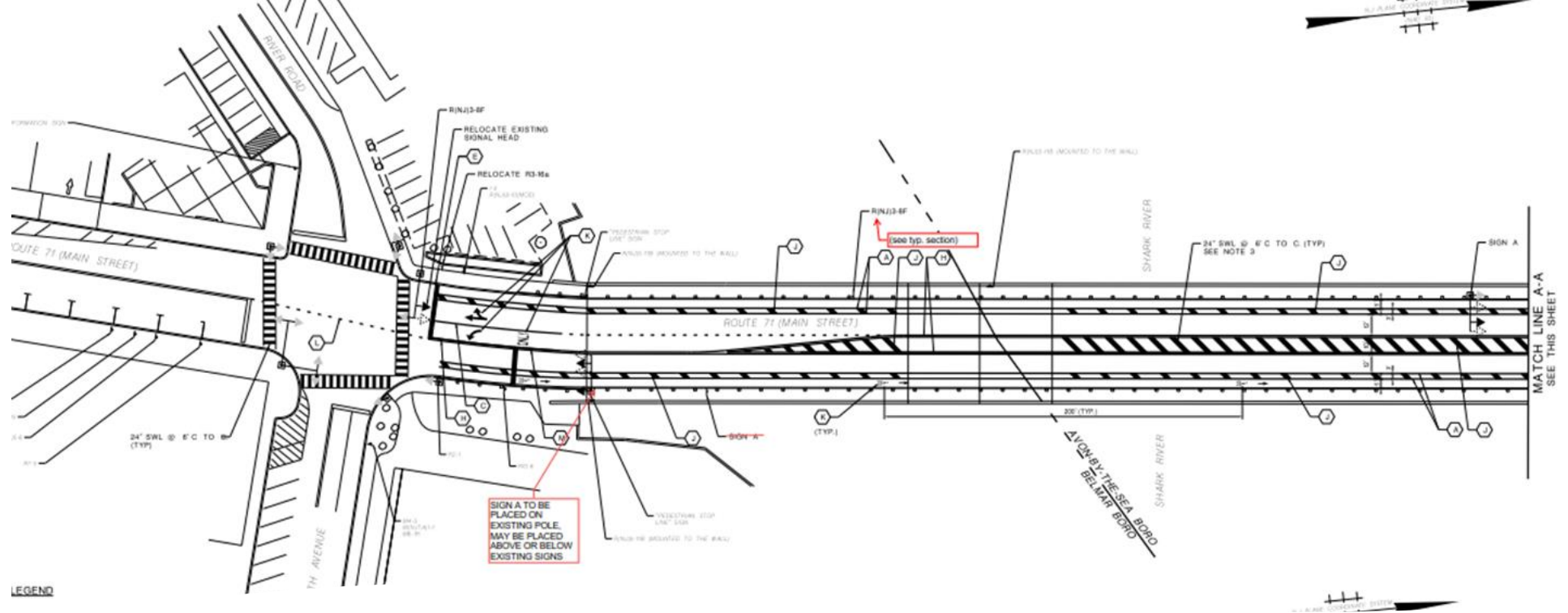
Route 71 Road Diet Design

- Northbound right lane across bridge converted to shoulder in 2004
- Short 1,200 ft two lane section remained across bridge southbound
- Aggressive driving across bridge
- Backups from left-turning vehicles
- No safe passage for bicycles
- Overall disconnect between both towns



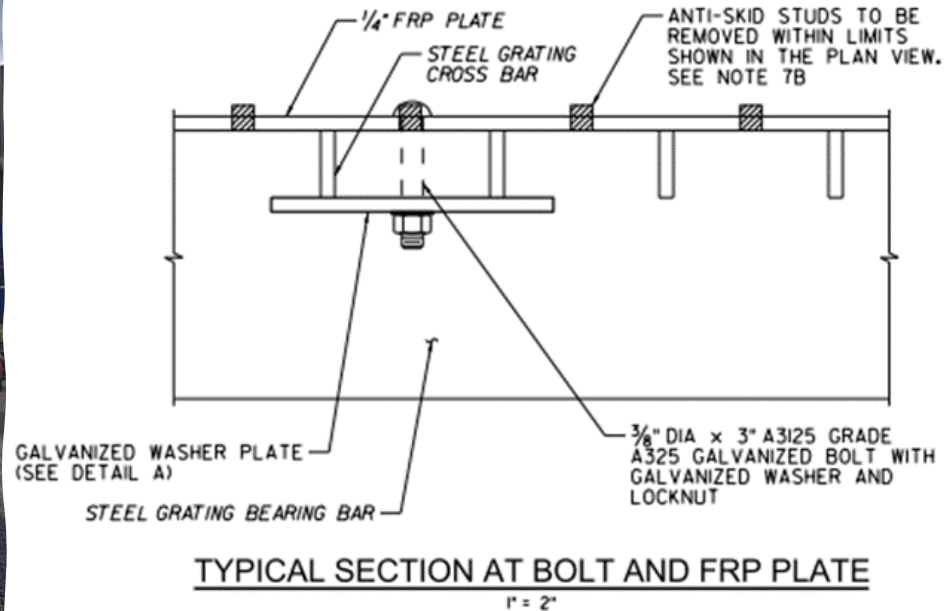
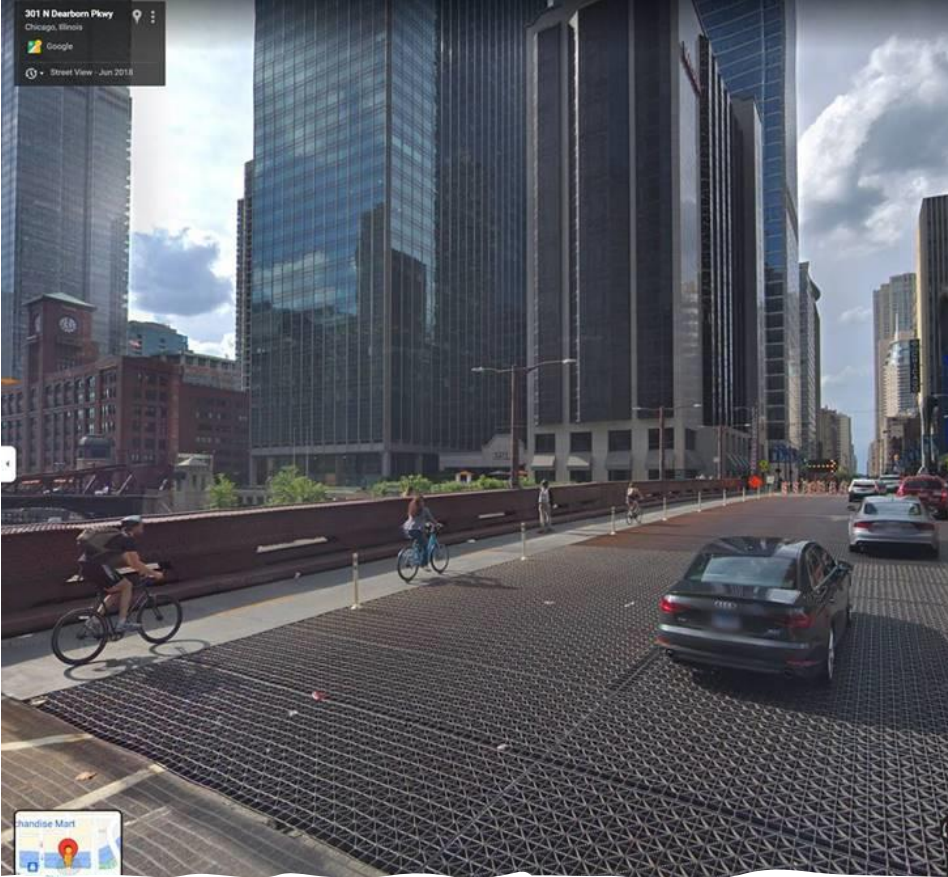
Route 71 Road Diet Design

- 50 foot roadway width allowed for bicycle facilities
- 10 foot striped center median
- 12 foot travel lane in each direction
- 3 foot separation
- 5 foot bike lane across structure



Route 71
Road Diet
Proposed
Improvements

- **Bicycle lanes extended across bridge from Avon-By-The-Sea into Belmar**
- **Elimination of merge in Belmar**
- **Dedicated left turn lane at Route 71 SB and 5th Avenue**
- **Additional parallel parking spots gained in Avon-By-The-Sea**



Route 71 Road Diet Design

- Innovative Fiberglass Reinforced Polymer (FRP) plate proposed for steel grid bascule span
- First of its kind on NJ drawbridges
- Used widely on Chicago River crossings
- Lightweight, would not affect span balance

Route 71 Road Diet Design



- **Design finalized in December 2021**
- **Significant internal coordination within NJDOT**
 - **Drawbridge Operations**
 - **Regional Operations**
 - **Structural Engineering**
 - **Traffic Engineering**
 - **Sign Shop**
 - **Office of Government & Community Relations**
- **Presented to Avon-By-The-Sea and Belmar**
- **Belmar easily accepted**
- **Avon-By-The-Sea initially voiced concerns**

Route 71 Road Diet Design

- Meeting held with Avon-By-The-Sea officials in January 2022
- Logic behind the road diet was detailed
- Township had several requests for extra work to be included in project
- NJDOT accommodated every request
- Road Diet agreed upon



Route 71 Road Diet Extra Work Requests



- **Install high-visibility hatching at all crosswalks in Belmar and Avon-By-The-Sea**
- **Protected/permitted left turn signal at Route 71 Southbound and 5th Avenue in Belmar**
- **Enhanced guide signs on Route 35, Memorial Drive, and Sylvania Avenue**
- **Coordinate with Monmouth County for upgrades to Sylvania Avenue**
- **Coordinate with major GPS companies to properly route Belmar and Avon-By-The-Sea traffic**

Route 71 Road Diet Public Outreach

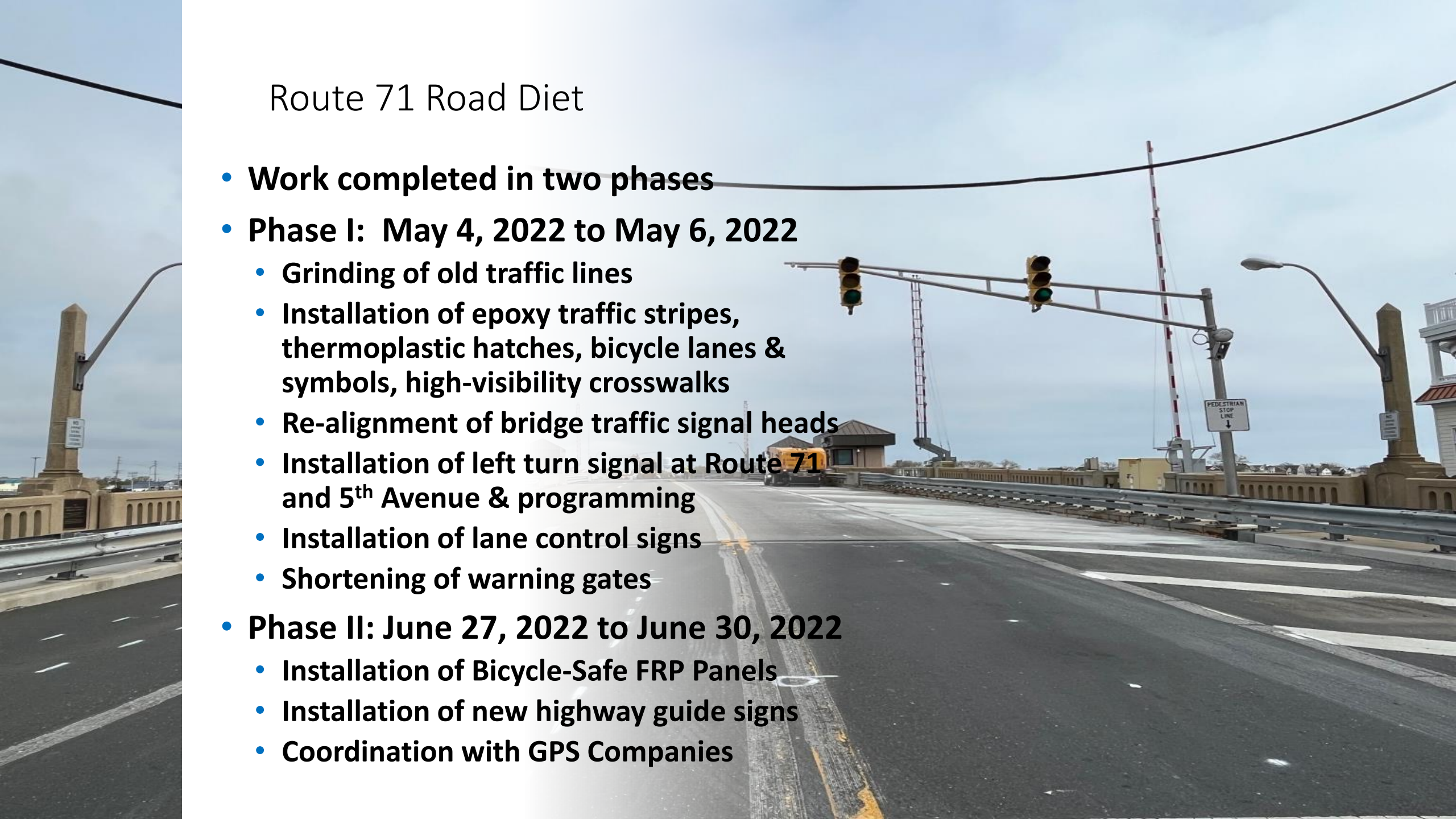


- **Townships requested informational video to alert public of upcoming changes**
- **NJDOT Office of Communications filmed video**
- **Description of Route 71 Road Diet**
- **Posted to NJDOT Social Media Pages**

[Rt 71 Drawbridge over Shark River Improvements - YouTube](#)

Route 71 Road Diet

- **Work completed in two phases**
- **Phase I: May 4, 2022 to May 6, 2022**
 - Grinding of old traffic lines
 - Installation of epoxy traffic stripes, thermoplastic hatches, bicycle lanes & symbols, high-visibility crosswalks
 - Re-alignment of bridge traffic signal heads
 - Installation of left turn signal at Route 71 and 5th Avenue & programming
 - Installation of lane control signs
 - Shortening of warning gates
- **Phase II: June 27, 2022 to June 30, 2022**
 - Installation of Bicycle-Safe FRP Panels
 - Installation of new highway guide signs
 - Coordination with GPS Companies



May 3, 2022



May 4, 2022



May 5, 2022



May 6, 2022



May 3, 2022



May 4, 2022



May 5, 2022



May 6, 2022





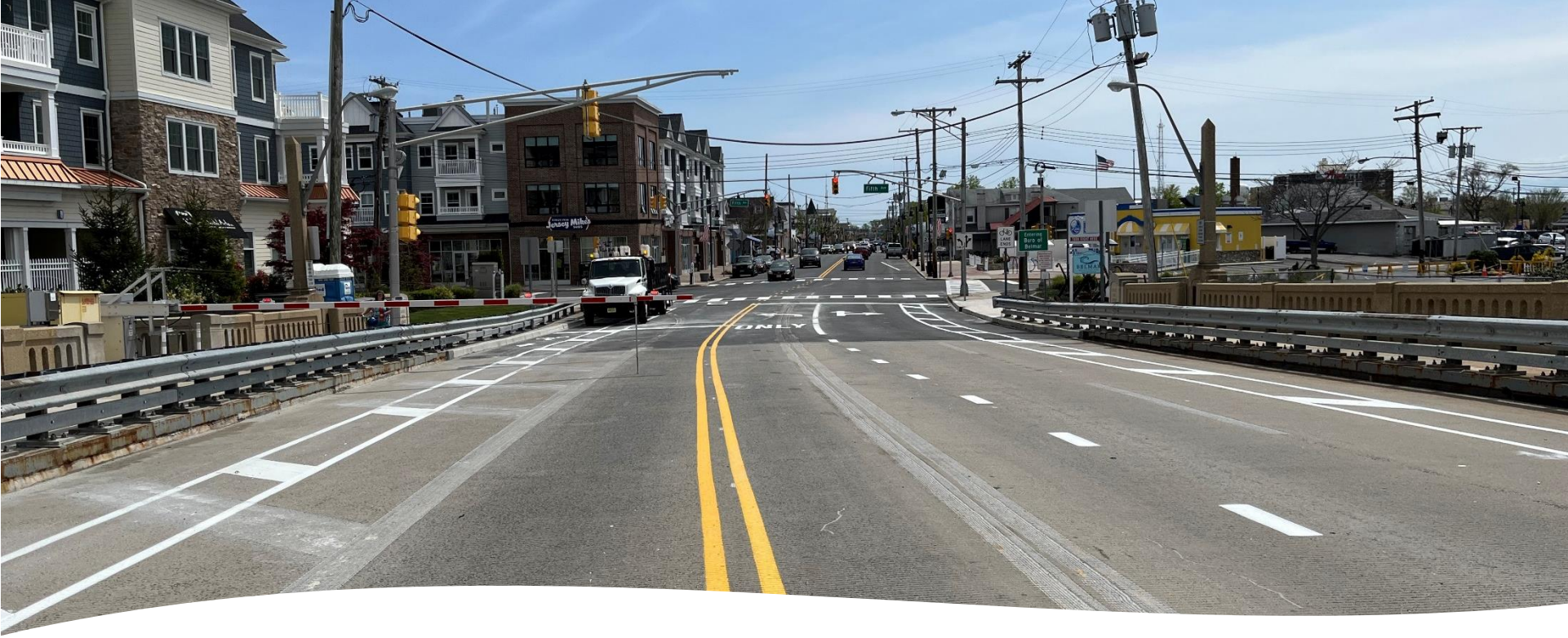
Installation of High-Visibility Crosswalks

- 18 intersections received crosswalk hatching
- 15 in Avon-By-The-Sea
- 3 in Belmar



Bridge Traffic Signal Adjustments

- Bridge signals had been configured for two-lane operation in each direction
- Road diet lane re-configuration required signal adjustments
- Signal heads re-positioned above traffic lanes
- Side mounted signal heads installed for bike lanes



Bridge Warning Gate Adjustments

- **Warning gates previously configured for two lane operation in each direction**
- **Road diet shifted lane configuration**
- **Gates extended past centerline after new striping installed**
- **Drawbridge Operations adjusted gates for new lane width**



Dedicated Left
Turn Lane at
Route 71 and
Fifth Avenue

- **Eight vehicle queueing capacity**
- **Safely removes left turning vehicles from through traffic**
- **Protected/Permitted left turn signal**
- **Pre-Empted with bridge operation**



Fifth Avenue Lane Control Installation

- East approach to Route 71 at Fifth Avenue previously two unmarked lanes
- One receiving lane opposite intersection
- Created confusion amongst drivers
- Dedicated left turn lane installed
- Through/right turn lane installed



Installation of Bike Lane

- **Bike Lanes extended $\frac{1}{4}$ mile over bridge from Avon-By-The-Sea to Belmar**
- **Required barge for installation**
- **Required balancing of span to accommodate FRP panels**



Coordination
With Monmouth
County

- **NJDOT Office of Community Relations coordinated with Monmouth County**
- **County installed new traffic pattern on Sylvania Avenue**
- **Bike Lanes installed from Route 71 to beach area (3/4 mile)**



Enhanced
Highway Guide
Signage

- **New signs installed:**
 - **Route 35 Seaview Circle**
 - **Route 35 and Memorial Drive**
 - **Route 35 and Sylvania Avenue**
 - **Route 71 and Sylvania Avenue**



Enhanced Highway Guide Signage

- **More directly route motorists to proper beach destinations**
- **Intended to keep motorists on state highway system**

Route 71 Road Diet GPS Company Coordination



- **NJDOT Office of Mobility coordinated with GPS Companies for routing changes**
- **Avon-By-The-Sea voiced concerns regarding GPS usage of residential streets**
- **Algorithms changed to better utilize state highways**
- **Belmar bound traffic from points north directed to utilize Route 35**
- **Belmar bound traffic on shore roads directed to utilize Route 71**



Route 71
Road Diet
Project Map

- **White X denotes high visibility crosswalk location**
- **Green square denotes enhanced highway guide signage**

Route 71 Road Diet Completion Public Outreach



- **NJDOT Office of Communications kept public aware of changes during construction through social media**
- **Completion video filmed after bike lanes officially completed**
- **Posted to NJDOT Social Media Pages**

[Rt 71 Over Shark River Bridge Safety Improvements - YouTube](#)

Route 71 Road Diet Completion



Total Cost: \$150,000



Monitoring & Evaluation

- Operations continues to monitor highway
- Drastic increase in bicycle traffic over bridge
- Signal timings effectively manage traffic
- Backups from bridge openings cleared within three traffic light cycles at Fifth Avenue
 - Measured at busiest lift times, 7:30AM & 2:30PM
- Overwhelming support from community



Route 71 over
Shark River
*Road Diet &
Safety
Improvements*

Awards

- **AASHTO (NASTO) Operations Excellence Award 2023**
- **FHWA Build A Better Mousetrap 2023 Bold Steps (National Award)**
- **NJ Society of Professional Engineers Public Project of the Year 2023 - 2nd Place**



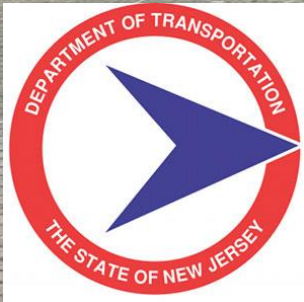
Looking Forward

- **Traffic flows, bicycle trends, and bridge operation will continue to be monitored**
- **Evaluation of FRP plates after a winter season**
- **Drawbridges and bicycle lanes can co-exist**
- **Looking at future uses of FRP plates in drawbridge applications**

Route 71 over Shark River

Road Diet & Safety Improvements

Thank you!



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