

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
BUREAU OF RIGHT OF WAY
HIGHWAY LAYOUT COMMISSION PUBLIC HEARING
DURHAM, X-A001(202), 16236

PROPOSED REPLACEMENT OF THE BRIDGE CARRYING
U.S. ROUTE 4 OVER BUNKER CREEK, (NH BRIDGE #145/116 AND
#8 ON NH'S 2014 BRIDGE PRIORITY LIST) IN THE TOWN OF
DURHAM. THE NEW BRIDGE WILL BE BUILT IN THE SAME
LOCATION AS THE EXISTING BRIDGE. THE PROPOSED
IMPROVEMENTS WILL ALSO INCLUDE THE RECONSTRUCTION OF
U.S. ROUTE 4 EXTENDING 1,300 FEET EAST AND 1,000 FEET
WEST OF THE BRIDGE.

Public Hearing held at the Durham Town Hall,
8 Newmarket Road, Durham, New Hampshire on
Thursday, May 28, 2015, in accordance with
RSA 230:14 and the Surface Transportation and
Uniform Relocation Assistance Act of 1987 to
discuss the above alterations to improve traffic
operations and safety in the Town of Durham,
New Hampshire, commencing at 7:00 p.m.

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DEPT. OF TRANSPORTATION
RIGHT-OF-WAY

JUN 11 2015

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1 PUBLIC HEARING THUS HELD BEFORE THE HIGHWAY LAYOUT
2 COMMISSION MEMBERS APPOINTED BY THE GOVERNOR AND
EXECUTIVE COUNCIL ON DECEMBER 9, 2014:

3 Dale Sprague, Chairman

4 George Rief

5 Thomas Richardson

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8 NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION MEMBERS
9 ATTENDING:

10 Keith A. Cota, P.E., Chief Project Manager, NH
Department of Transportation, Bureau of Highway Design

11 John Butler, P.E., Assistant Chief of Preliminary
12 Design, NH Department of Transportation, Bureau of
Highway Design

13 Nancy Spaulding, P.E., Right of Way Engineer,
14 NH Department of Transportation, Bureau of Right of Way

15 Marc Laurin, Environmental Project Manager, NH
Department of Transportation, Bureau of Environment

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P R O C E E D I N G S

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2 CHAIRMAN SPRAGUE: This meeting is called
3 to order. I am Dale Sprague of Somersworth,
4 Chairman of this Commission appointed by the
5 Governor and Executive Council. George Rief of
6 Durham and Thomas Richardson of Durham are also
7 members of this Commission.

8 This hearing is concerned with the
9 replacement of bridge number 145/116 carrying U.S.
10 Route 4 over Bunker Creek. It is pursuant to
11 RSA 230:14 and the Surface Transportation and
12 Uniform Relocation Assistance Act of 1987.

13 The purpose of this hearing is to
14 determine the necessity of the occasion of the
15 layout and to hear evidence of the economic and
16 social effects of such a location, its impact on
17 the environment, and its consistency with the
18 goals and objectives with such local planning as
19 has been undertaken by the town.

20 Following the hearing, this Commission
21 will evaluate all matters brought to our attention
22 and make definite decisions relative to the
23 layout. The Department will contact each owner

1 whose property is affected to discuss individual
2 concerns. It is, therefore, important that all
3 individuals desiring to make requests or
4 suggestions do so tonight.

5 I would remind you that you have 10 days
6 from the date of this hearing to submit any other
7 material you would like considered by this
8 Commission.

9 At this time I'll ask Keith Cota, Project
10 Manager from the New Hampshire Department of
11 Transportation, to present in a formal manner the
12 layout which has -- he has proposed.

13 After this we will open the floor to
14 those who wish to address the Commission. I will
15 request that all desiring to speak signify their
16 desire and, upon recognition by me, step to the
17 microphone, state their name and address, and make
18 their statements. This hearing is being recorded,
19 and a trans -- a transcript will later be
20 prepared. Keith will now present the layout.

21 MR. COTA: Thank you, Mr. Chairman.
22 Members of the Commission, ladies and gentlemen,
23 good evening. It is a pleasure to be -- this

1 evening to be here on behalf of the Department to
2 present the proposed layout for the replacement of
3 the U.S. Route 4 Bridge over Bunker Creek in the
4 Town of Durham.

5 My name is Keith Cota. I'm the Chief
6 Project Manager for the New Hampshire Department
7 of Transportation. Tonight's meeting is a public
8 hearing to present the Department's preferred
9 alternative for the replacement of the Bunker
10 Creek Bridge, which is located about 1.3 miles
11 east of the Route 108 grade-separated interchange
12 with U.S. Route 4 in the Town of Durham. It is
13 also located about 2.1 miles west of the Route 4
14 at-grade intersection of the Boston Harbor Road
15 and Spur Road intersection in the City of Dover.

16 Before I begin with the Department's
17 presentation, I'd like to introduce several of my
18 colleagues from the Department who will be helping
19 with tonight's project overview. Located near the
20 presentation plans is John Butler. He's Assistant
21 Chief to Preliminary Design within our Bureau of
22 Highway Design. He will be presenting the
23 detailed aspects of the proposed layout.

1 On my right is Marc Laurin. He's the
2 Senior Project -- Environmental Project Manager,
3 and Marc will be providing an overview of the
4 environmental categorical exclusions that have
5 been completed for the project.

6 On John's right is Nancy Spaulding.
7 She's our Right of Way engineer within the
8 Department's Bureau of Right of Way, and she will
9 be providing a summary of the right of way process
10 for the project.

11 I'd also like to acknowledge other
12 members of the Right of Way staff who are present
13 this evening that are recording the proceedings
14 this evening and who have been instrumental in
15 setting up this public hearing.

16 Karen Kimel. She's, I believe, out in
17 the back of the room. Donald Labelle, Linda
18 Schofield, Dena Rea, and John Johnson. Also
19 attending this meeting -- this meeting this
20 evening is Bill Cass, our Assistant Commissioner,
21 and Robert, Bob, Landry and Joe Adams from the
22 Bureau of Bridge Design, and Darren Blood, who's
23 also representing GM2 Associates, which is our

1 consultant working with the Department on the
2 project.

3 We will try to be succinct as possible in
4 presenting the project information and anticipate
5 our presentation will take about 30 minutes.
6 Following the presentation, Commission Chairman
7 Sprague will open the floor for comments and
8 questions for the record.

9 We are here this evening to address the
10 replacement of the -- of the existing single-span,
11 reinforced concrete slab bridge for the passage of
12 the Bunker Creek under U.S. Route 4. This project
13 is in the State's Ten-Year Plan -- Ten-Year --
14 excuse me -- State's Ten-Year Transportation
15 Improvement Plan for funding in the fiscal year
16 2019, and the bridge is number eight on the 2014
17 Bridge Priority List.

18 The original bridge was constructed in
19 1933. U.S. Route 4 is a major arterial state
20 highway. It is under the federally designated
21 National Highway System. The bridge is a -- has a
22 short span of 15 feet and a narrow, curb-to-curb
23 width of 30 feet. And the tidal vertical

1 clearance at mean low tide is about 12.8 feet.
2 The Bunker Creek is a tributary to the Oyster
3 River which flows into the tidal of Great -- Great
4 Bay Basin.

5 Today the bridge is functionally and
6 structurally obsolete to accommodate the current
7 and future traffic along U.S. Route 4. Traffic
8 along the state highway today is about 16,000 cars
9 per day.

10 In developing the project alternatives,
11 we have attempted to limit the impacts to the
12 abutters, natural resources within the tidal
13 influence area. In October of 2013, the
14 Department presented study alternatives at a
15 public informational meeting held here in Durham.

16 Several important issues discussed at
17 this meeting are addressed as part of the design
18 layout, including improvements to U.S. Route 4
19 approach for vertical -- vertical geometry that
20 limits stopping and intersection sight distance,
21 least environmental impacts into the natural
22 resources, and minimize -- minimization of right
23 of way impacts to abutting properties and

1 construction constructability in consideration of
2 the underlining marine clay that is in the
3 tidal -- tidal area and the ledge interface which
4 is along the east approach of the -- of the
5 bridge.

6 Based upon the findings of our geotech
7 evaluations and input from public meeting --
8 from the -- from the public meeting, the
9 Department's preferred alternative is shown on the
10 display boards which John will present tonight in
11 greater detail.

12 The plans we are presenting this evening
13 are preliminary plans. Based upon the -- your
14 input, the geotech recommendations that -- that we
15 still have to complete, there will be further
16 modifications made to the final design level
17 plans.

18 Much of the engineering work will be
19 required -- much more engineering work will be
20 required to develop the plans to a point where we
21 can more precisely identify the right of way
22 impacts and provide the design details needed for
23 construction.

1 Tonight's meeting is a significant
2 milestone in the project's development where it
3 transitions from the preliminary design phase to a
4 final design and right of way procurement
5 process -- phase.

6 I will now ask John Butler to present the
7 plans in more detail, and John's presentation will
8 refer to the plans that are on the display on --
9 on the boards.

10 MR. BUTLER: Thank you, Keith. Good
11 evening, Members of the Commission, ladies and
12 gentlemen. I'd like to start just by describing
13 the types of plans that we have here on the board
14 and getting everyone oriented on the plans.

15 This is the plan that depicts the new
16 proposed improvements. So Route 4 headed east in
17 this direction towards Newington; Route 4 headed
18 west towards Lee would be in this direction.

19 Bunker Creek is right here in the middle.
20 Bunker Creek flows southerly into the Oyster
21 River. So the bridge on Route 4 over Bunker Creek
22 is right here.

23 A couple other landmarks. Towards the

1 west end of the project area is this Riverview
2 Road intersection right here, and then Morgan Way
3 intersection is right here on the plan.

4 A quick note about the coloration on the
5 plan. The colors represent different features of
6 the proposed design. Some of the more significant
7 ones: the yellow area is the proposed travel
8 lanes of the roadway. The brown areas on either
9 side of the yellow are the proposed shoulders of
10 the roadway. There's a lighter green-shaded
11 areas, which you see here, that's the grading
12 that's required to blend the proposed work into
13 the adjacent topography of the adjacent
14 properties.

15 Below this plan we have a profile of
16 Route 4. So this shows the ups and the downs of
17 the road as you drive along Route 4 through the
18 project area. So in this case the bridge over
19 Bunker Creek is right here in the middle of the
20 plan. It has the same horizontal scale as the
21 plan above, but it has an exaggerated vertical
22 scale. The horizontal scale is one inch equals 50
23 feet, and the vertical scale is one inch equals 10

1 feet in elevation.

2 And the other plan further down the
3 boards here, this plan depicts one of the traffic
4 control alternatives for the project, which I'll
5 be describing in more detail in just a little bit.

6 We've had a couple graphics that depict
7 the current stage of the proposed bridge design
8 element. And at the very end there's just an
9 aerial photograph of the overall project area and
10 a graphic depicting the typical cross-section of
11 the proposed roadway work that -- that we intend
12 to do on Route 4.

13 And, lastly, some graphics here which I
14 will also speak off of a little later. This is
15 the other alternative for maintenance of traffic
16 while we construct the bridge. And then these are
17 just some pictures of the existing bridge showing
18 some of the existing structural concerns with the
19 existing bridge.

20 So, as Keith mentioned, the primary
21 purpose of the project is to replace the bridge on
22 Route 4 over Bunker Creek. The -- the new bridge
23 will be essentially right where the existing

1 bridge is and will not change the alignment of
2 Route 4. That will stay the same as it is today.

3 The new bridge will be a fair bit longer
4 than the existing bridge. The new bridge will be
5 about 60 feet in length whereas the existing
6 bridge, as Keith mentioned, is only about 15 feet
7 in length. And the new bridge will be a little
8 bit wider than the existing bridge.

9 We would have five-foot wide shoulders on
10 each side of the bridge adjacent to the two
11 12-foot wide travel lanes that are there. The
12 existing bridge has between two and three-foot
13 wide shoulders on each side. So about two or
14 three feet of widening on each side, not only to
15 the bridge but also to the roadway approaches
16 in -- in the area of the bridge.

17 And the total limit of work on -- on
18 Route 4 depicted by the limits in yellow that you
19 see on the plan is about some 800 feet to the west
20 of the bridge to 800 feet to the east of the
21 bridge. So right about to the Morgan Way -- just
22 past the Morgan Way intersection.

23 We -- in addition to the -- to the modest

1 amount of widening of the roadway that I
2 described -- oh, we are planning to retain the
3 existing turning lane at the Morgan Way
4 intersection, so we'll keep the eastbound left
5 turn lane and the westbound right turn lane at the
6 Morgan Way would stay the same as they are today.

7 We are proposing to do some improvements
8 to the profile of Route 4. Today the bridge is in
9 this low point, this sag vertical curve, we call
10 it. And then to the east the road rises up, and
11 there's a crest in the road, and then Morgan
12 Way -- Morgan Way intersection would be right
13 about here on the profile.

14 The existing profile is deficient in
15 terms of the amount of sight distance that it
16 provides, both for drivers along Route 4 and for
17 drivers trying to pull out of Morgan Way. If
18 you're -- if you're trying to pull out of Morgan
19 Way looking to your right over this crest in the
20 road, there's really not as much sight distance
21 there as we would like to have for the 45 mile per
22 hour speed limit that exists on this section of
23 roadway.

1 So what we are proposing to do is to
2 lengthen and flatten both this sag vertical curve
3 and this crest vertical curve to smooth that out
4 and give longer sight lines, both to people
5 traveling along Route 4 and for people trying to
6 pull out of Morgan Way.

7 So, in addition to that, an issue that we
8 have to keep in mind is here at the bridge we have
9 to be sure and keep the new bridge above the
10 hundred-year flood elevation for -- for Bunker
11 Creek. And because we're -- we're building a
12 longer bridge than what is there today, the new
13 bridge will also be thicker, deeper, if you will,
14 so -- so the profile does have to come up to some
15 degree because of that issue to stay above the
16 hundred-year flood elevation of Bunker Creek.

17 So, taking all of those things into
18 account, what the profile shows here is a raise in
19 elevation in the bridge area of about three feet
20 over where the existing road is today and a
21 lowering of the elevation of Route 4 towards the
22 top of the crest, which would be in this area
23 right here, also of about -- of about three feet

1 lower than what it is today.

2 There are still some issues that we need
3 to further flesh out, and this profile may adjust
4 a little bit up or down based on what we find with
5 those issues. Those two issues, Keith touched on
6 them both, but the primary issues are in the area
7 to the west of the bridge or in the bridge area
8 and within this causeway area of Bunker Creek what
9 we found with the subsurface borings that we've
10 done so far is that there's a very thick layer of
11 marine clay underneath the roadway and underneath
12 the bridge here, and that presents a challenge in
13 that as you -- as you widen and raise the height
14 of the roadway here, that puts more weight on
15 that, and that material will tend to compress and
16 settle over time, so we need to account for that
17 in our -- in our design.

18 So in essence the -- the less that we
19 could raise the profile here, the better we are in
20 terms of that particular issue. Conversely, the
21 area -- and that's in the area of the crest, and
22 we're looking to lower the crest. We also know
23 from some borings that we've done that there is

1 ledge very close to the surface of the existing
2 roadway not far below the surface of the existing
3 roadway, so the more we cut, the more we drop the
4 elevation here, the more we're going to get into
5 having to excavate and remove that ledge material.

6 So, from that perspective, having less
7 cut at the crest is better in terms of minimizing
8 the amount of ledge removal. So we're going to
9 have to do more exploration to get a better handle
10 on exactly where the ledge is up in here and where
11 the soft soils are down in here and do more
12 analysis to determine what the -- what the
13 settlement issue is, how much this material will
14 compress as we put additional load on it.

15 So ultimately those things will probably
16 result in this profile being tweaked a little bit,
17 but I think generally what's presented here is in
18 the ballpark of what we will end up with
19 ultimately.

20 Another major challenge with this project
21 is going to be maintaining traffic during
22 construction. Since we are proposing to build a
23 new bridge essentially right where the existing

1 bridge is, we need to put the Route 4 traffic
2 somewhere else temporarily while we're building
3 the new bridge.

4 So basically we have two alternatives
5 that we're currently considering. One is depicted
6 on this plan, and if we build it, it's shown in
7 purple on here, to build a temporary bridge and
8 what we call a temporary diversion or a detour, if
9 you will, around the existing bridge allowing us
10 to build a bridge and the roadway while traffic is
11 on that temporary diversion. And I'll give some
12 more details on that in just a minute.

13 The other basic alternative is to
14 actually close Route 4 to all traffic near --
15 right at the -- immediately at the bridge area for
16 a relatively short period of time, and our goal
17 for that would be, I think, as Keith also has
18 mentioned, two weeks or hopefully less. And,
19 again, that depends on further fleshing out of
20 some of these engineering issues and other
21 considerations, but our goal would be in the
22 ballpark of two weeks or less for that road
23 closure.

1 If we went with that alternative, then we
2 would have a formal, signed detour for the Route 4
3 traffic to go around the bridge area. So on this
4 plan the bridge is right here in the white circle.
5 So here's Route 4. This is the Spaulding Turnpike
6 over here. This is Route 108 over here.

7 So we are suggesting that the detour
8 would be, if you're headed eastbound, up Route 108
9 to Exit 7 on the Spaulding Turnpike and then down
10 the Spaulding Turnpike to Dover Point and to
11 points beyond, and then the same in the reverse
12 direction.

13 Let me go back and describe a few more
14 details of the diversion alternative, and then
15 we'll come back and finish talking about the
16 detour alternative. With the diversion
17 alternative, as you can see in the purple here,
18 the idea is to build a new bridge, a temporary
19 bridge, and a temporary roadway immediately to the
20 north of the existing bridge and roadway.

21 Traffic would then be moved onto that
22 detour. We would remove the existing bridge,
23 build the new bridge, do the roadway work, move

1 traffic back onto the newly constructed bridge and
2 roadway, and then remove the temporary diversion.

3 So some of the issues associated with
4 this are there are additional property impacts
5 associated with this diversion construction,
6 primarily to these three properties to the east of
7 the bridge on the north side of the road.

8 In fact, the impact to this property,
9 parcel number seven, the Eckhardt property, is
10 actually a leach field that we know of that would
11 be impacted by this layout, and so we would have
12 to make arrangements to either have that
13 reconstructed somewhere else on the property, if
14 that's feasible, or temporarily make arrangements
15 of pumping of the septic system until the detour
16 gets removed, and the leach field could be rebuilt
17 in its existing location. So that's certainly an
18 issue with this alternative.

19 There would also be additional temporary
20 impacts to natural resources in this area here of
21 Bunker Creek, initial impacts to the tidal
22 wetlands. So that's -- that will be an issue in
23 terms of the environmental permitting required

1 to -- to accomplish that.

2 And we will have to deal with the soft
3 soils and a settlement issue with this
4 alternative. We actually have to deal with it
5 twice, once while we construct the temporary
6 diversion here, and then once again when we --
7 with the ultimate improvement in the roadway
8 profile in this area.

9 So with this scenario, we would most
10 likely address that soft soil issue using, I would
11 say, more conventional methods, which is basically
12 to place the fill material in the area that you're
13 looking to construct the roadway, let it sit there
14 for a period of time while it consolidates the
15 soft soils underneath, and once it stabilizes, go
16 ahead and build your roadway. The issue with that
17 is that stabilization can often take weeks, if not
18 months for it to become stable.

19 And the last issue I wanted to point out
20 with this alternative for traffic control is that
21 the cost of this temporary diversion is
22 significant. We estimate it to be about \$900,000
23 just to construct the temporary bridge and the

1 temporary roadway that you see here. So, you
2 know, this has added a significant cost to the
3 project that you don't have with the idea of
4 closing the road and using a detour off-site.

5 So let's talk about some of the issues
6 and pros and cons with the idea of closing the
7 road and using an off-site detour. The idea
8 behind this would be that once we close the road
9 here in the immediate bridge area, we will
10 construct the new bridge and the roadway work,
11 these profile adjustments, using accelerated
12 bridge and accelerated roadway construction
13 techniques.

14 Basically what that means is as far as
15 the bridge goes, using prefabricated pieces,
16 sections, as much as possible. They're built
17 off-site, brought to the site, and set in place in
18 a much quicker fashion than conventional bridge
19 construction.

20 And as far as the embankment goes, there
21 are innovative techniques available to stabilize
22 these soft soils in a faster manner, but it is
23 also, like I said, fairly innovative, unusual

1 techniques and fairly expensive compared to the
2 conventional techniques of just placing the
3 material there and letting it settle over time.

4 So there is an additional cost associated
5 with doing those accelerated construction
6 techniques, but the goal being that if we can find
7 a way to do those things in that two-week,
8 roughly, time period, that that would allow us to
9 then reopen the road. You know, that's a big
10 advantage timewise over the diversion alternative.

11 So as far as the detour goes, I've
12 already described basically the route that we see
13 for the detour. It's actually distancewise, if
14 you were to drive from one end of the bridge all
15 the way around the detour to the other end of the
16 bridge, that's a total of about 12 miles.

17 I think, more importantly, if you're a
18 regional traveler on Route 4 traveling through the
19 area, the additional distance to go up 108, down
20 the Spaulding as opposed to across here on
21 Route 4, that's about an additional five miles to
22 do this versus that.

23 There are certainly other detour routes

1 possible that -- that people could choose to use.
2 Route 155 up here. It probably would be some --
3 it probably would be attractive to some regional
4 travelers, and there are other routes in the
5 vicinity that could potentially be used, but at
6 this time we envision the Route 108 and Spaulding
7 Turnpike routes to be the official signed detour,
8 but we would not preclude people from using other
9 routes if they chose to.

10 So there are certainly some issues and
11 concerns with this detour route. One of them is
12 that up here at Exit 7 where Route 108 intersects
13 the Spaulding Turnpike there is a series of four,
14 closely-spaced, signalized intersections here that
15 we know that there already is congestion that
16 occurs there, at least there are certain parts of
17 the day. There are two schools in Dover here very
18 close to that area that also contribute to the --
19 to the traffic flow at that interchange.

20 So, you know, obviously adding a
21 significant amount of additional traffic here is
22 going to significantly increase the congestion,
23 and the delay is getting through that area. We

1 don't envision all of the traffic that currently
2 uses Route 4 will use this route.

3 Our estimate is that maybe around 50
4 percent of it will use this route, and the other
5 50 percent will disperse to other routes. But
6 even 50 percent of this significant volume of
7 traffic on Route 4 adding to this interchange, I
8 would say, is definitely going to significantly
9 increase the congestion, the backups, the delays
10 in getting through that while the -- while the
11 closure is in place. The idea is that the closure
12 will be limited to a relatively short time frame,
13 so this -- this issue will be limited to that
14 roughly two-week time frame when the bridge is
15 closed.

16 Another issue associated with the detour
17 route is there is a toll plaza on Spaulding
18 Turnpike, and the Dover Toll Plaza is right here
19 on this plan, so anyone choosing to use this
20 route, this section of the Spaulding, as the
21 detour route would go through the toll plaza and
22 would be required to pay the toll at the toll
23 plaza. So that's another issue with this -- with

1 this detour route.

2 And a couple other issues that we would
3 need to further coordinate if we chose to go with
4 this alternative for maintaining traffic is what
5 to do with bicycles and pedestrians here at the
6 bridge area. I don't know that there's a lot of
7 bicycles. I don't know that there's a lot of
8 pedestrians. There may be a fair amount of
9 bicycles, but we would have to look further into
10 exactly how much usage there is by those -- those
11 folks and how to accommodate them while we have
12 the road closed here during that short time frame.

13 And, lastly, we would certainly need to
14 coordinate with emergency responders in the area
15 who are going to get affected by this potentially
16 longer route to -- to respond to calls and see if
17 we can put things into place to help -- to help
18 mitigate that issue, again, during that short time
19 frame.

20 So ultimately we will need to decide on
21 one or the other of these maintenance of traffic
22 scenarios, the on-site diversion or the road
23 closure with the off-site detour.

1 The factors that we need to get more
2 information on prior to making an ultimate
3 decision are we do need more follow-up on the
4 engineering issues that I talked about, the soft
5 soils, the ledge, how long is it really going to
6 take us to -- to construct this in here if we did
7 close the road down for a short period of time.

8 We need to further coordinate with local
9 officials who would be impacted by the detour
10 route, so Durham, Madbury, certainly Dover, to get
11 their input on -- on the detour route and maybe
12 possible ways to help mitigate the -- the impact
13 to congestion via the detour route.

14 We need to coordinate with other Route 4
15 users, particularly the trucking industry. This
16 is certainly a heavy trucking route from
17 Portsmouth to points west.

18 And, lastly, we will -- we will also
19 consider other public input. Input that we get
20 tonight from any of you relative to these two
21 ideas for maintaining traffic is going to be
22 considered in our final analysis before making a
23 decision on what we're going to do here for

1 maintenance of traffic.

2 So that's definitely a big issue that we
3 need -- we need to do a little bit more work on,
4 and we need to coordinate more with some other --
5 some other groups before deciding what makes the
6 most sense on that issue.

7 I've got two more issues that I wanted to
8 talk about in describing the proposed design.
9 Going back to this plan, which shows the ultimate
10 layout and impacts of the proposed design, there
11 are impacts to private properties with this
12 proposed layout.

13 We are proposing to acquire a strip of
14 property along the south side of Route 4 basically
15 from the creek all the way to a point I'd say
16 about a thousand feet to the east of Bunker Creek.
17 So there's four properties affected by that
18 proposed strip acquisition.

19 The strip of acquisition is about 15 feet
20 wide in general, and the reason we're proposing
21 that is because the existing right of way here is
22 essentially right at the end of pavement of the
23 existing road, so there really is no place for us

1 to maintain a guardrail here, maintain the
2 drainage, place signs, utility poles, pile snow.

3 You know, typically we need at least 10
4 to 15 feet adjacent to the end of pavement for all
5 of those -- all those maintenance purposes. So
6 that's why we're proposing to acquire that strip
7 of property here. At this point the right of way
8 jogs out and becomes wider, and -- and we don't --
9 we don't need additional property.

10 In addition to that, you will also see on
11 the plan several proposed drainage easement areas
12 as shown in this orange. It's probably hard to
13 see from where you are, but orange rectangles
14 shown on the plan. Those will be permanent
15 easements that we would need to acquire for
16 drainage purposes for the highway drainage.

17 The two most significant ones are shown
18 here on -- this is the Fish and Game property
19 that's just to the west of Bunker Creek, and then
20 also here on the Town of Durham property just to
21 the east of Bunker Creek.

22 These are two areas that we're looking at
23 for potential storm water treatment, and what that

1 means is we would construct a grass-lined swale
2 where some of the roadway runoff would get
3 collected and routed to that treatment area and
4 then would flow through the treatment -- treatment
5 swale before discharging into Bunker Creek either
6 here or, if we use this one, to flow here into
7 Bunker Creek.

8 And so those -- those treatment swales
9 provide a measure of filtration of the runoff from
10 the roadway, filtering out some of the sediment,
11 some of the pollutants to try to improve water
12 quality before discharging into Bunker Creek.
13 That's an issue that we're required to look at in
14 order to get the appropriate environmental permits
15 for this or any project.

16 In addition to those areas, we do show
17 several smaller drainage treatment areas generally
18 around existing culverts or catch basins where,
19 again, the issue is the -- the end of the culvert
20 or the catch basin is very close to the right of
21 way line, and we really don't have the means
22 currently to -- to legally maintain them unless we
23 acquire these -- the easements that would give the

1 ability here as part of this project or in the
2 future to maintain those drainage structures or
3 replace those drainage structures.

4 The slope work, the grading required to
5 build this project and primarily the profile
6 changes that we've talked about do have impacts to
7 some trees adjacent to the roadway. Probably the
8 biggest area of impact is here on the south side
9 of the road just to the east of Bunker Creek
10 across parcel number five, which is Mr. Tirrell's
11 property.

12 There is a row of trees along Route 4
13 here between the two driveways, and I think a good
14 portion of those are impacted by this work because
15 we are looking at lowering the roadway here, and
16 doing that undercuts those trees and would require
17 impacting and removing a good portion of those
18 trees. There are some other tree impacts to a
19 lesser extent on the north side of the road as
20 part of parcel seven, the Eckhardt property.

21 And certainly we already discussed if we
22 were to go with the diversion alternative, there
23 is even more significant impacts to trees on the

1 north side of the road here required to construct
2 this temporary diversion layout if we were to
3 choose that for our maintenance of traffic
4 scenario.

5 There will be some impacts to the
6 existing utility poles in the project area.
7 Probably at least half a dozen will need to get
8 relocated. We've already started coordinating
9 with the utility companies to find an appropriate
10 place for those to move to, both temporarily
11 during construction and then permanently where
12 they would end up needing to be placed.

13 And the last thing I wanted to mention
14 was that all these plans that you see here on the
15 board tonight are available on the project's
16 website for viewing or downloading. And the
17 address for the project website is in the lower
18 left-hand corner of this hearing handout, which if
19 you didn't get these, I know there's extra copies
20 out back.

21 So after the meeting tonight, later on,
22 you want to look at the plans in more detail,
23 these are all there as PDFs. You can zoom right

1 in and see more specifically what's depicted on
2 the plans.

3 So with that, Keith, I turn it back to
4 you.

5 MR. COTA: Thank you, John, for the
6 detailed presentation of the layout as well as
7 outlining the two potential construction
8 approaches the Department is investigating. As
9 John noted, the length of time for the closure for
10 U.S. Route 4 is highly influenced by the -- by the
11 settlement period for the underlining marine clay.

12 We still have more geotech information to
13 acquire in order to fully evaluate that -- that
14 approach, but it is our hope to limit the closure
15 alternative to less than -- to less than 14 days,
16 if possible. Otherwise, the diversion alternative
17 may be the necessary alternative we would have to
18 take.

19 As part of this project evaluation, the
20 Department must consider and document
21 environmental impacts that will result from the
22 proposed action. At this time I'll ask Marc
23 Laurin to provide a summary of the environmental

1 study completed for the project. Marc.

2 MR. LAURIN: Thank you. Good evening,
3 Members of the Commission, ladies and gentlemen.
4 Pursuant to the National Environmental Policy Act,
5 the Department of Transportation has evaluated the
6 potential impacts the project will have on the
7 social economic and environmental issues.

8 Coordination was established and input
9 received from federal and state agencies,
10 including the Army Corps of Engineers, the New
11 Hampshire Fish and Game Department, New Hampshire
12 Wetlands Bureau, the New Hampshire Natural
13 Heritage Inventory, and New Hampshire Division of
14 Historical Resources. In addition, input was
15 received from town and regional officials and
16 concerned citizens.

17 After evaluation of the information
18 gathered, a Draft Categorical Exclusion Document
19 has been prepared. The following is a brief
20 summary of some of the information in that
21 document.

22 A noise evaluation was conducted to
23 assess and determine the presence and extent of

1 any noise impacts within the project area in
2 accordance with the Department's noise abatement
3 policy. Four residential properties presently are
4 at or exceed the noise abatement criteria. For
5 the 2037 build alternative, one additional
6 residence is anticipated to meet this criteria.
7 These results are identical to that for the
8 no-build alternative.

9 Noise abatement barriers were evaluated
10 for all of the impacted receptors. A
11 determination of barrier feasibility and
12 reasonableness found -- reasonableness found that
13 none of the noise barriers evaluated was found to
14 be reasonable according to the cost criteria, and
15 as such noise mitigation will not be provided in
16 association with this project.

17 The project will not have any adverse
18 impacts to the air quality in the area, nor will
19 it contribute to violation of the National Ambient
20 Air Quality Standards.

21 An initial site assessment was completed
22 to identify potential oil or petroleum
23 contamination and hazardous materials that may

1 occur within a thousand feet of the project
2 corridor. This included reviews of the New
3 Hampshire Department of Environmental Services'
4 OneStop database and Environmental Data Resources
5 Inc., which is an on-line database search
6 provider.

7 Three residential properties located in
8 the vicinity of the project area were identified
9 as having past releases. However, these
10 properties were listed as closed and require no
11 further action, and as such there is no
12 contamination concern relative to the project
13 area.

14 Pursuant to Section 106 of the National
15 Historic Preservation Act of 1966, the Department
16 identified and assessed the project's impacts to
17 cultural resources, which are buildings,
18 historical districts, structures, as well as
19 archaeological sites which are generally greater
20 than 50 years old.

21 It was determined that no historic
22 properties are located within the area of
23 potential effect of the project. A determination

1 was made in consultation with the Federal Highway
2 Administration and the New Hampshire Department of
3 Historical Resources that no historic properties
4 will be affected by the project.

5 Archaeological sensitive areas within the
6 project area are not anticipated to be impacted.
7 However, the proposed action -- the proposed
8 action will not affect the area adjacent to the
9 burial ground, the Twombly burial ground, located
10 just beyond the limits of the project. However,
11 if excavations are to occur within 25 feet of the
12 site, monitoring by a qualified archaeologist will
13 need to occur.

14 There are approximately seven-tenths of
15 an acre of permanent wetland impacts to both tidal
16 and nontidal wetlands with the additional
17 seven-tenths of an acre of temporary impacts. An
18 additional acre of temporary impacts would occur
19 if the on-site diversion -- with the on-site
20 diversion traffic option.

21 These impacts will require a Major Impact
22 Dredge and Fill Permit from the New Hampshire
23 Department of Environmental Services Wetlands

1 Bureau, and a State Programmatic General Permit
2 needs to be obtained from the U.S. Army Corps of
3 Engineers.

4 Mitigation discussion has been initiated
5 with the Wetlands Bureau and the Corps. An
6 in-lieu fee to the New Hampshire Department of
7 Environmental Services Aquatic Resource Mitigation
8 fund is being considered. If there are other
9 local mitigation opportunities of which the
10 Department should be made aware of, please notify
11 us during the hearing comment period.

12 As John stated, to improve water quality
13 within the project area, two storm water treatment
14 systems are being evaluated. These would have
15 impacts to two conservation properties, New
16 Hampshire Fish and Game Department, Palmer tract,
17 and the Town of Durham's open space conservation
18 land. Coordination with both Fish and Game
19 Department and the Town of Durham regarding
20 whether these impacts can be accommodated under
21 the conservation easements will need to occur.

22 The project is located within the Oyster
23 River floodplain. The proposed wider span of the

1 bridge is expected to provide a net increase in
2 capacity, and no increase will occur to the base
3 flood elevation.

4 A review of the National -- the New
5 Hampshire Natural Heritage Bureau database for
6 records of rare species and exemplary natural
7 communities was performed. It is not anticipated
8 that any impacts of these species and communities
9 located in the vicinity of the project will occur.

10 The construction contractor will be
11 directed to prepare and implement a Storm Water
12 Pollution Prevention Plan that will provide strict
13 erosion and sedimentation control measures during
14 construction affecting the integrity of the Oyster
15 River and Bunker Creek.

16 Temporary increases to noise and dust
17 levels are anticipated during construction of the
18 project. These temporary increases are expected
19 to return to normal after construction. If anyone
20 has any natural, cultural or socioeconomic
21 resource concerns associated with this project,
22 please bring them to our attention tonight or
23 within the comment period following the public

1 hearing.

2 A copy of the draft environmental
3 document is available for anyone who wishes a copy
4 or to review it. Please see me after hearing if
5 you would like to view it. This concludes my
6 presentation. Thank you.

7 MR. COTA: Thank you, Marc. As the
8 project will involve property acquisitions and
9 easements, I'd like Nancy Spaulding to talk about
10 the right of way process. Nancy.

11 MS. SPAULDING: Thank you, Keith. Good
12 evening, Members of the Commission, ladies and
13 gentlemen. Before I go into the right of way
14 procedures for this project, there are a couple of
15 items I would like to mention.

16 First, as Chairman Sprague stated, if
17 anyone wishes to submit additional testimony as a
18 result of this hearing or in regard to these
19 plans, you can address the material to Chairman
20 Sprague, care of the Director of Project
21 Development, and mail it to the NH D.O.T. address
22 shown on the hearing handout, doing so within 10
23 days of tonight's hearing. It will become part of

1 the official testimony of the hearing. Your
2 letter will receive equal consideration to
3 anything presented here tonight. The handouts are
4 available, as John mentioned, in the lobby with
5 our clerk, Karen.

6 We also have with us tonight copies of a
7 booklet entitled, "Public Projects and Your
8 Property." The booklet will describe the right of
9 way acquisition and relocation assistance
10 procedures that are utilized by the State. This
11 booklet is especially important for the property
12 owners directly affected by the proposed project.
13 These are also available from Karen in the lobby.

14 If, after reviewing the information
15 received at the hearing and the 10-day comment
16 period, Chairman Sprague and the Commission
17 Members find necessity for the layout, several
18 things will happen.

19 First, with approval to proceed with the
20 design of this project, the Department will begin
21 preparing appraisals for each of the properties
22 affected by the proposed construction that you see
23 on the plans.

1 A Department staff appraiser or a fee
2 appraiser hired from private industry will contact
3 each owner to appraise their property. The
4 appraisals will reflect the fair market value of
5 the property rights needed for the new
6 construction.

7 Prior to starting negotiations, the
8 appraisals are reviewed separately to see that all
9 appraisals are accurate and have taken into
10 account all applicable approaches to value. The
11 value in the reviewed appraisal will be the offer
12 of compensation used by the Layout Commission
13 consisting of the members you see here tonight.

14 The Commission Members have been
15 appointed by the Governor and Executive Council as
16 a basis for negotiation. A Commission Member with
17 a Department Right of Way agent will visit each
18 property owner and discuss each acquisition
19 separately.

20 We encourage owners at that time to ask
21 questions and bring up concerns they feel should
22 be considered. If the property owner is satisfied
23 with the offer, deeds are prepared, and ownership

1 is transferred to the State. If the owner is not
2 satisfied with the figures that the Commission
3 offers, they can appeal to the New Hampshire Board
4 of Tax and Land Appeals and argue for additional
5 compensation.

6 It is important that you understand that
7 this can be done with or without an attorney.
8 Either party can appeal the Board's decision to
9 the Superior Court if they are unsatisfied.

10 Anytime after this hearing or before
11 design approval, all information in support of
12 this hearing is available at the Department's
13 headquarters in Concord for your inspection and
14 copying.

15 And I also want to reiterate John's
16 comment. Information is also available on the
17 Department's website at this email address where
18 you can find all of the materials from tonight and
19 other important materials that will be made
20 available from tonight's hearing. Thank you, and
21 that is all I have.

22 MR. COTA: Thank you, Nancy. As Nancy
23 had noted, following the public hearing a

1 transcript will be prepared. It will include all
2 the testimony from this hearing tonight as well as
3 written statements during the 10-day -- 10-day
4 write-in period.

5 Please refer to your handout. Up in the
6 upper corner is the -- is the address you can
7 mail -- mail your written -- written letters into.
8 They will be acknowledged as part of the record.

9 Now, the Department, once we have all the
10 data, the Department will evaluate the complete
11 testimony and make recommendations on how these
12 requests, those requests and issues, can or cannot
13 be addressed. These recommendations will be
14 presented to the Hearing Commission at a future
15 public meeting in a document called, "Report of
16 the Commissioner."

17 The Hearing Commission will judge the
18 sufficiency of the Department's resolution of the
19 hearing issues and decide on the necessity for the
20 project. If the Hearing Commission finds in favor
21 of the necessity of the project, the project will
22 proceed into a final design phase, and right of
23 way acquisition phase will begin.

1 The plans will be developed in more
2 detail to determine the elements such as the
3 drainage needs, the utility relocation, the final
4 grading. Once all of the necessary approvals and
5 permits are obtained and the right of way
6 procured, the project will advertise for
7 construction, which we anticipate will occur in
8 the late fall of 2018 with construction commencing
9 in 2019.

10 The public -- traveling public will see
11 workers on the construction site for about three
12 months with a closure alternative and about 18
13 months with the diversion alternative. Both
14 options will use flaggers during noncommuter hours
15 outside of the two-week -- outside of the two-week
16 closure period.

17 The project -- the estimate for the --
18 the estimated cost for the project is three
19 million dollars for construction with the roadway
20 closure but with the -- but would increase to
21 close to four million dollars with the temporary
22 diversion alternative.

23 The project cost will be funded through

1 the Federal National Highway System program, and
2 at this time there are no town funds required for
3 the project.

4 This concludes the Department's
5 presentation. I'd like to thank all of you for
6 your attention and patience. I'd also like to
7 thank the Town of Durham staff, UNH students, as
8 well as UNH staff for their time and effort in
9 assisting us in this project.

10 At this time I formally request,
11 Mr. Chairman, the Commission find occasion for the
12 necessity for the layout of the project as
13 presented at this hearing. Thank you for your
14 consideration.

15 CHAIRMAN SPRAGUE: Thank you, Keith.
16 Before I open the meeting to comments, concerns,
17 and questions, I'm going to go off script a little
18 bit here, and, Chief Landry, you wished -- I know
19 you have a meeting at eight o'clock. If you would
20 like to go first.

21 CHIEF LANDRY: I appreciate that. Thank
22 you. Yes. Corey Landry. I'm the Durham Fire
23 Chief. I'm very concerned about the closure

1 option for the obvious reasons. The first obvious
2 reason is cutting us off from a good section of
3 our town. Yes, we work with mutual aid, and we
4 can figure that out, but there will still be a
5 significant delay.

6 One thing that has been in consideration,
7 and I know McGregor EMS is here tonight, and I am
8 sure they'll address it. The critical issue is
9 Portsmouth Hospital. Every hospital is not the
10 same, and I'm sure they'll address the critical
11 issue of Portsmouth Hospital and the need to have
12 fast access to that hospital and not be delayed
13 and have to go around. So by closing it off it
14 causes significant delay in that.

15 My concern beyond that is traffic. I --
16 I hear -- well, first of all, I'd like to mention
17 I'd like to -- I'd rather hear worst-case scenario
18 on road closure and not best case. The one that's
19 two weeks, I take it is best case. I'd like to
20 hear worst case, if that's even out there. I'd
21 rather talk that way. I apologize, but my layman
22 side of every project I've seen has never been on
23 time on these -- on these such things.

1 Traffic. When we close Route 4 right now
2 for an emergency, we see a high percent of that
3 traffic travel 108 to Spruce Drive in Dover,
4 the -- the Back River Road, Piscataqua back to
5 Route 4, not the one -- not the -- not the
6 Spaulding Turnpike or back that way. They take
7 the shortest way possible, and it gets extremely
8 backed up. And I know there's a Dover police
9 officer here. I believe he speaks to that
10 tonight.

11 When that starts to happen, the next
12 place we see is they come down 108, Dover Road
13 into Newmarket right past here and cause an
14 extreme backup this way, and it -- 'cause traffic
15 in Newmarket is not even addressed here. The
16 assumption that no cars are going to go that way,
17 I think, is -- is poor at that -- at that point.
18 That's what we see all the time. If we see any
19 closures down, that's what happens, and that's
20 going to cause a lot of stress in this town.
21 There's already a lot of traffic in this town.

22 Going back to the Dover side of it, I'm a
23 Dover resident. I travel 108 every day. In the

1 Exit 7 area the on and off ramps, two to three
2 times a day right now is a nightmare. And -- and
3 I -- please stand corrected and check that.
4 There's four schools that affect that. Ever since
5 the Portsmouth Christian Academy has moved in by
6 Garrison School, there's tremendously impact to
7 traffic in that area, which will be on top of this
8 as well.

9 So my serious concern is the traffic
10 aspect of it. People are going to look for the
11 shortest way possible to try to stay as -- as
12 close to their original route as they can. So
13 they're going to come up Route 4 to 108 and split
14 one way or the other. I don't see many of them
15 going all the way to Spaulding, and that's a big
16 concern of ours. So is being cut off for EMS
17 transports. I appreciate your time.

18 CHAIRMAN SPRAGUE: Thank you, Chief
19 Landry. Do we have any elected officials in the
20 room tonight who would like to speak? Do we have
21 any town officials that would like to speak? Come
22 up and state your name.

23 MR. SPEIDEL: Thank you, Mr. Chairman.

1 My name is Mark Speidel. I'm a sergeant with the
2 Dover Police Department. I represent the City of
3 Dover's interests tonight. As Chief Landry had
4 indicated, and I think you had mentioned in your
5 presentation, sir, you're considering a detour
6 alternative. We have several comments in the
7 event of a detour alternative.

8 Namely, emergency management officials
9 from the three affected communities, Dover,
10 Madbury, and Durham, would work together to
11 provide a system of temporary coverage and mutual
12 aid response for emergencies east of the Bunker
13 Hill -- or Bunker Creek Bridge.

14 We ask that you consider a target time
15 period for the detour. Again, if the detour is
16 considered to be when school is not in session.
17 Ideally June 20th through August 28th would be
18 your target time period. That would minimize
19 student transportation impacts, particularly east
20 of the Bunker Creek Bridge, and traffic impacts to
21 Route 108 in Dover, particularly Exit 7
22 interchanges but also some of the other signalized
23 intersections with Mast Road, you know, along

1 Route 4, the Back River Road intersection in
2 Dover.

3 We ask that you consider a contingency
4 plan, particularly if the detour period is not
5 during the summer months, whereby the Exit 7
6 interchanges, Route 108, Locust Street, Back River
7 Road, and Mast Road as well would be staffed at
8 peak traffic periods with combination of police
9 officers and traffic control personnel at a cost
10 to be included in the project.

11 We ask that your traffic control and your
12 detour sign plan include enhanced signage to
13 prohibit commercial vehicles and heavy truck
14 traffic on the local roads, particularly Back
15 River Road, Piscataqua Road, Mast Road, and Spruce
16 Lane, which would be the nearest, closest detour
17 route for traffic.

18 Finally, while it's fair to say that
19 Dover officials are not enamored with the prospect
20 of a full closure detour, we also acknowledge that
21 we could live with -- probably live with just
22 about anything for a period of two weeks. We
23 pledge to work with you to help mitigate traffic

1 to the extent possible.

2 Finally, I have a question for either
3 Mr. Cota or for whoever can answer it. I'm a
4 little fuzzy on my contract letters. On the
5 Newington/Dover Bridge project at the Exit 7
6 interchange, is that contract Q?

7 MR. COTA: Yes, it is.

8 MR. SPEIDEL: The time line of contract Q
9 in terms of implementation as it relates to the
10 time line of this project, and is there going to
11 be any spillover that might affect the sign plan
12 in making it more confusing for motorists if
13 you're trying to implement a detour or not
14 implement a detour. Any comment you might have on
15 that we appreciate.

16 MR. COTA: May I?

17 CHAIMAN SPRAGUE: If you know now.

18 MR. COTA: Yes, we do. Contract Q is the
19 last roadway portion of the project along the
20 Newington -- Dover/Newington project. Basically
21 it's the construction of the Dover approach on the
22 Spaulding Turnpike.

23 During the duration of this contract

1 here, in two thousand and -- on the basis that
2 we're under construction in 2019, we'll be in the
3 second full year of construction under the --
4 under the Dover construction portion of the
5 Spaulding Turnpike. So there will be some --
6 there will be construction activity going on in
7 the -- in that area where we'll be looking to
8 detour -- detour traffic through.

9 With the detour of -- as Mike outlined,
10 going straight up the Spaulding Turnpike certainly
11 would be beneficial to the Q contract in some
12 means because instead of having to deal with the
13 traffic getting off to get Route 4, they can go
14 straight through, vice versa coming down the
15 Spaulding Turnpike.

16 So there's actually some potential
17 advantages for -- for closure alternatives for the
18 Q contract because we manage that traffic a little
19 bit more easier than what we do managing it off
20 Route 4, but it will have an influence on -- on
21 signage.

22 We do have what we call a smart work zone
23 sign packages for the Newington/Dover, which we

1 would certainly look to incorporate as part of
2 this closure here. It's a more advanced
3 electronic signage of -- of -- of giving warnings
4 to the traveling public at key locations, like
5 beyond -- by Route 155 or -- or Route 108 and so
6 on to alert the traffic as to the -- as to the
7 detour, time it takes to get through the detour,
8 and so on. So those will all be things that we
9 would have to put our arms around in making sure
10 we fully, fully analyze and determine how to --
11 how to develop that.

12 CHAIRMAN SPRAGUE: Thank you, Keith. Are
13 there any other town officials that would like to
14 speak? State your name.

15 CHIEF MALASKY: I'm Rick Malasky. I'm
16 the Chief of Newmarket Fire from the south. I
17 just wanted to bring -- I know you're talking
18 about sending everyone up to Dover, but whenever
19 there's an incident on 108 or the Spaulding or
20 Route 4, the traffic always comes to Newmarket,
21 and it backs up due to the lights on 33 and
22 Squamscott, believe it or not, and Newfield at 85.
23 It literally will back up almost up the Durham

1 point over here on 108, Newmarket is gridlocked.

2 This happens right now frequently with
3 the work that's going on on the bridges over
4 there. And they're going to come that way whether
5 you tell them to go to Dover. They -- for
6 whatever reason, they like to take 108. There's
7 only two ways around Great Bay. It's 108, 33 or
8 the Spaulding. And it's something that needs to
9 be considered because it shuts us right down. And
10 I just wanted to bring that to everybody's
11 attention.

12 CHAIRMAN SPRAGUE: Thank you.

13 CHIEF MALASKY: Thank you.

14 CHAIRMAN SPRAGUE: Once again, any other
15 town officials that would like to speak? Going
16 once. I will now open the meeting to anyone
17 desiring to be heard. Again, I would ask that you
18 raise your hand and, upon recognition by me, come
19 to the microphone, give your name and address, and
20 make your statements. The gentleman in the red.

21 MR. COTE: Thank you, Mr. Chairman. My
22 name's Bill Cote. I live on Littlehale Road here
23 in Durham, and I'm the Executive Director from

1 McGregor Memorial EMS.

2 We're a regional emergency ambulance
3 service serving the communities of Durham, Lee,
4 Madbury, and the University of New Hampshire.
5 Many patients are transported to Portsmouth
6 Regional Hospital, PRH, by McGregor EMS every
7 week.

8 Portsmouth offers a number of clinical
9 services unavailable at other hospitals in the
10 area. For example, Portsmouth is the only level
11 two trauma center on the Seacoast and the only
12 facility on the Seacoast capable of performing
13 open heart surgery. As a result, they receive
14 some of the most seriously ill or injured patients
15 we encounter.

16 In our understanding that replacing the
17 bridge over Bunker Creek on Route 4 in Durham,
18 that the D.O.T. does have some plans to close the
19 road entirely for two weeks or longer. We have
20 some very serious concerns over this decision for
21 the following reasons.

22 Number one, there are many residences,
23 farms, and recreational areas east of the project,

1 and road closure would preclude our access to them
2 in a timely fashion. While one may posit that
3 either Dover or Newington ambulances could serve
4 this area, quite frequently Dover is unavailable
5 due to their call volume, and Newington could also
6 be committed to a simultaneous call. In either
7 case, a significant delay in accessing a patient
8 would occur, and additional load would be placed
9 on our neighbors.

10 McGregor cannot stage an ambulance east
11 of the project as this impacts our operational
12 capabilities for the remaining communities, and no
13 suitable facility exists to house an ambulance and
14 crew, which is required by State law.

15 As PRH is the only level two trauma
16 center on the Seacoast, critically injured
17 patients are transported to this facility, as I
18 stated. The State of New Hampshire patient care
19 protocols stress that transporting trauma patients
20 to a designated level one or level two trauma
21 center to ensure that patients receive specialized
22 care they need as rapidly as possible.

23 As with many serious medical emergencies,

1 time is critical. Extending the time that it
2 takes for these patients to arrive can place
3 patients at greater risk of death or serious
4 disability. This past week we conducted some time
5 trials that I'd like to just share with you
6 briefly.

7 We chose to look at time travel to
8 Durham -- to Portsmouth Regional Hospital from
9 this Town Hall facility. And the normal route
10 travel over Route 4 from Durham Town Hall to PRH
11 is 15 minutes. From the Durham Town Hall up
12 Route 108 to the Spaulding Turnpike is 22 minutes.
13 That is a seven-minute difference. From the
14 Durham Town Hall, down 108 here to Route 33 is 29
15 minutes, an additional 14 minutes.

16 These trials were performed as a common
17 and familiar starting point using Durham Town Hall
18 and would travel during off-peak hours without
19 lights and sirens. There are many national
20 studies that show the amount of time saved
21 utilizing lights and sirens is very small and has
22 really minimal impact.

23 Our ability to respond to emergencies

1 beyond the closure would also be negatively
2 impacted. To demonstrate this, additional time
3 trials were performed coming from McGregor EMS
4 station, which is located on the campus of UNH, to
5 a common, well-known case -- location -- excuse
6 me -- in this case, Wagon Hill.

7 So, for example, McGregor EMS, our
8 station on Route 4, the normal travel path takes
9 seven minutes for us to reach Wagon Hill Farm. If
10 McGregor then was asked to go through the detour
11 route that you've described, we would choose
12 probably to go Route 108 to Mast Road to Spruce
13 Lane to Piscataqua Road to Back River Road and
14 finally to Wagon Hill Road. That takes 16
15 minutes, which is an additional nine minutes of
16 travel.

17 The trials were performed in a similar
18 manner as I described to the other one. To the
19 average driver, a delay of seven, nine or even 15
20 minutes is a simple inconvenience and even an
21 annoyance. To the patient who has a serious
22 traumatic injury or is suffering a heart attack,
23 this additional time can have significant impact

1 on not just their ability to recover but also
2 sometimes their ability to even survive.

3 McGregor Memorial EMS respectfully
4 requests that NH D.O.T. provide a temporary bridge
5 capable of carrying all emergency vehicles. The
6 residents and visitors to our communities as well
7 as the traveling public deserve the best emergency
8 care possible. Thank you, Mr. Chairman.

9 CHAIRMAN SPRAGUE: Thank you. And thank
10 you for taking the time to compile that data for
11 us. Anyone else wish to speak? Yes.

12 MR. LUNDHOLM: I'm Jere Lundholm, 104
13 Piscataqua Road here in Durham. And I have a few
14 comments. The first relates to the closure, and I
15 think very strongly that the benefits far outweigh
16 the risks in terms of closure.

17 By closing the road, one has the benefit
18 of not constructing a temporary bridge with a
19 significant impact on the environment, the benefit
20 of being able to significantly accelerate
21 construction and cut the total construction time
22 down, and the ability to significantly reduce the
23 cost.

1 The stakeholders that are probably most
2 impacted, most inconvenienced are the two families
3 immediately adjacent to the bridge and either side
4 of the bridge, the west side and the east side.
5 They have to detour the furthest. They suffer
6 probably the greatest delay in emergency services,
7 however remote those. That is likely. And I can
8 tell you that both of those families accept that
9 inconvenience. Both feel that closing the road,
10 the benefits far outweigh the inconvenience and
11 the risks.

12 Second, in the presentation I see that
13 the bridge is being raised, and the knoll or crest
14 is being shaved. And that of course means more
15 fill in the wetlands and inevitably a wider
16 footprint in addition to compaction problems and
17 other problems that were mentioned.

18 Another option is of course to shave the
19 crest more and not raise the bridge as much or not
20 at all. I understand ledge is a concern at the
21 crest, but my understanding is there's only one
22 boring that's been done up there, and that boring
23 doesn't show ledge until one gets down well below

1 10 feet. If that's the case, my suggestion would
2 be to do some more borings up there before
3 discarding that option.

4 Third, the present span of the bridge,
5 length of the bridge, is 15 feet, and now we're
6 going to 60 feet, four times as much. That opens
7 up the passageway where the creek is and just
8 exposes Bunker Creek and the marsh grass on the
9 north side more to erosion.

10 I've lived my life on Oyster River, and I
11 see what the wave action does in that particular
12 area. And the wider that opening is, the more
13 prone to erosion the creek and the marsh grass is
14 going to experience. So I would urge that that
15 span be as short as possible.

16 Another comment relates to the traffic
17 guards. The traffic guards at Scammell Bridge and
18 Scammell Bridge Causeway are recessed concrete
19 panels with a short rail on top. I find them very
20 attractive, and my experience has been before and
21 after that those guards cut down on the noise that
22 propagates out over the open water considerably,
23 particularly the tire noise.

1 And I would recommend that those guards
2 be given serious consideration at Bunker Creek,
3 the Bunker Creek Bridge, and the Bunker Creek
4 Causeway. Actually the recessed panel has some
5 historical significance in that the original
6 guards on the first Bunker Creek Bridge had
7 recessed concrete panels.

8 Another comment with regard to taking
9 some more right of way on the south of the road to
10 the east. I'm sure this will be addressed by my
11 neighbor, Loring Tirrell, but let me just suggest
12 that there may be a possibility of shifting the
13 center line to the north.

14 It appears to me that the right of way is
15 wide enough at that point perhaps to accommodate
16 the road and the shoulders without taking any
17 right of way at all, which is a benefit to the
18 abutters in that area, and it reduces the cost and
19 reduces the time because it does take time to deal
20 with the right of way issues.

21 And, finally, I guess I just have a --
22 perhaps not a comment but a question. At the
23 public information meeting in October of 2013, as

1 I recall, there was the detailed design of a
2 bridge that was presented, and that bridge was a
3 design that provided for very rapid construction,
4 it was claimed, and, I believe, a shorter time
5 frame for the road closure.

6 It included, for example, drilled
7 concrete columns supporting the bridge rather than
8 driving pilings. It included pre-stressed
9 concrete components that could be constructed
10 off-site and brought in and assembled very
11 quickly, accelerating the whole bridge
12 construction more rapidly.

13 My question is how much has that been
14 incorporated in this particular design? I
15 don't -- I don't see it. My follow-up question
16 would be if that hasn't been included, I know it
17 was a study commissioned by D.O.T., why hasn't it
18 been included? It seemed to have a lot of
19 features that are quite beneficial which I've
20 named. I think that's it. Thank you very much.

21 CHAIRMAN SPRAGUE: Thank you. Excuse me.

22 UNIDENTIFIED SPEAKER: Sign your name.

23 MR. LUNDHOLM: Oh, sure.

1 CHAIRMAN SPRAGUE: Anyone else wish to
2 speak?

3 MR. TIRRELL: Thank you. My name is
4 Loring Tirrell, 108 Piscataqua Road in Durham. I
5 live directly east of the Bunker Creek Bridge. It
6 seems to me that this whole project comes down to
7 money and environment, and we've got to do
8 everything we can do in today's world to reduce
9 the expenditures as much as possible and also
10 protect the environment.

11 I am a major stakeholder in this project
12 because of the location that I'm in, and in
13 viewing the blowup of the latest plans, I have
14 some concerns and suggestions that I really urge
15 that D.O.T. consider.

16 First of all, building a 600-foot,
17 temporary bridge over the salt marsh at Bunker
18 Creek could be absolutely disasterous. It's
19 already a very fragile ecosystem.

20 It's been my experience, having viewed
21 the estuary for five decades, that anytime that
22 there's a removal, either man-made or
23 weather-made, from -- of eelgrass, it just never

1 comes back the way it ever did before. And I
2 can't imagine that a temporary bridge, the
3 construction and deconstruction of a temporary
4 bridge, wouldn't destroy a tremendous amount of
5 this salt marsh grass that's in Bunker Creek.

6 Next, I'd like to address the shift in
7 the center line. Again, I may be reiterating a
8 few things that Jere has said, but, according to
9 the plan, it certainly appears to me that there's
10 more room to shift the center line, if it needs to
11 be shifted at all, to the north.

12 This would -- this would eliminate a very
13 lengthy and very arduous legal process of taking
14 land from residents. I understand it is an
15 expensive venture. It is a very lengthy venture.
16 It would obviously impact me tremendously.

17 I do -- I intend to stand very firm on
18 this, especially since we aren't -- we aren't
19 squeezed so much that we -- if the center line
20 needed to be moved, it couldn't be moved a bit to
21 the north rather than the south, not directly --
22 therefore, not directly impacting abutters to the
23 project.

1 In regard to the elevation of the bridge,
2 the first preference would be keep the bridge at
3 the current elevation. If it's not possible, then
4 keep the elevation as low as possible. The higher
5 the elevation, the greater the footprint,
6 resulting in greater economic and environmental
7 impact.

8 Next regarding the actual construction.
9 Jere had already touched on this. I'd like to
10 also touch on it. I think it's imperative to keep
11 the span of the bridge as narrow as possible.
12 This would protect Bunker Creek and the salt
13 marsh, again, from erosion due to wave action.

14 A 60-foot span with a southeast storm
15 could be catastrophic to the salt marsh. It would
16 only take one or two storms, and we'd have nothing
17 but a pool in there, so I think that it has to be
18 considered very, very seriously to keep the span
19 as narrow as possible. It should keep the cost
20 down. It should keep the ecosystem of the salt
21 marsh as it is. It would be beneficial to
22 everybody, both economically and environmentally.

23 I'd like to cite a study, a safety study,

1 that was done in September of 2000 -- of the year
2 2000. It's a Route 4 safety study performed by
3 SEA Consultants and Rizzo Associates. I think
4 this is very imperative that D.O.T. revisit the
5 findings, summary, and recommendations of this
6 study.

7 The area in consideration for the
8 construction was designated by the study as a
9 residential section. A recommendation deemed as
10 high priority by the study was to reduce the speed
11 limit in the residential section to 40 miles an
12 hour.

13 In a June, 2000 public meeting, the speed
14 reduction to 40 miles an hour from Route 108 to
15 Back River Road was strongly endorsed by all
16 people present. You may ask what's the importance
17 of lowering the speed limit to 40 miles an hour.
18 Well, other than safety concerns, it would
19 dramatically change the design elevations of the
20 project.

21 The results of these changes would be
22 less elevation of the bridge and less shaving of
23 the crest east of the bridge. Again, the result

1 of this would be smaller footprint with less
2 destruction to stakeholders and, more importantly,
3 a reduction to the economic and environmental
4 impact to the entire project.

5 So a reduction to 40 miles an hour must
6 be reexamined by D.O.T., and it has to be very
7 seriously explored. This would -- this would
8 reduce the costs of the project a tremendous
9 amount. It would reduce the impact to all the
10 abutters a tremendous amount. It would be
11 beneficial to everybody.

12 We have a speed limit now of 50 miles an
13 hour to 108 and then 45 miles an hour from 108
14 down just past the hill at Wagon Hill Farm, and
15 then reducing there to 35 miles an hour. It seems
16 to me that a five mile an hour reduction in speed
17 from 108 to Back River Road would be a very small
18 price to pay for the amount of economic and
19 environmental impact we can save with this.

20 I'd also like to just refer back to the
21 informational hearing that was held in Durham in
22 October of 2013. This -- the designs we see here
23 are radically different than those that were

1 presented at that meeting. I'm a little confused,
2 also, as Jere was, as to why the differentiation.

3 At that time the on-line design, which
4 the -- don't tell people at D.O.T., but the
5 on-line design essentially was a design within the
6 same footprint of the road now. There were
7 considerations of moving the road north and moving
8 the road south, but D.O.T. preferred the on-line
9 design rather than either the north or south
10 route.

11 And I will quote directly from the
12 summary of the minutes of that. The reasons
13 D.O.T. -- the reasons cited for D.O.T. for
14 preference of the on-line design minimizes impacts
15 to properties, minimizes impacts to natural
16 resources, minimizes impacts to cultural
17 resources, and it's possibly the most economical
18 alternative.

19 I think that design has to be
20 reconsidered. And, again, I urge D.O.T. to
21 consider any proposed alternatives to the current
22 design that would keep the project in the existing
23 right of way and reduce the economic and

1 environmental impacts to the project. Thanks very
2 much.

3 CHAIRMAN SPRAGUE: Thank you. I guess
4 I'm going to refine the script and say come to the
5 podium, please state your name and address, and
6 sign in. I have not been saying that. It's not
7 on the script. So anyone else in the audience
8 that would wish to speak?

9 MR. MURPHY: Good evening. I'm Patrick
10 Murphy, 5 Williams Way. Our property is on the
11 north side adjacent to the town property that's
12 been mentioned for the swale. Our concern
13 references at this point the diversion option.

14 I was told tonight that it's 75 feet
15 that's needed from the edge of the current
16 pavement onto our property. We have a historic
17 stone wall that goes back to the Black Hawk Farm
18 days that is about 25 feet from the edge of that
19 pavement. At about the 30-foot mark is the
20 beginning of the -- what I call a forest. It's
21 our large trees. They've been there for
22 generations.

23 The diversion plan, many of those trees

1 would be lost. The wall would have to be removed.
2 That brings into a consideration of what we see
3 when my wife and I are in our home. We have a
4 home with mostly glass facing the south. At this
5 point we have very little view of highway traffic
6 on Route 4. We have sound. In spite of the
7 trees, in spite of our own arborvitaes which
8 provide a sound barrier, our concern is both
9 losing that buffer in sight and increasing noise
10 if the diversion option goes through.

11 We also have a concern since our home is
12 built on fill. There was a slope -- we weren't
13 here at the time. There was a slope from the
14 street gently down to Bunker Creek and down to
15 Route 4. The contractor converted that to a
16 building lot using fill. Our house sits on that.
17 We have a septic system on the back lawn. We have
18 a concern about construction, especially this
19 mention of ledge tonight. If the construction
20 would affect our infrastructure. Those are my
21 basic comments. Thank you.

22 CHAIRMAN SPRAGUE: Thank you.

23 MS. SMITH: Good evening. My name is

1 Marjorie Smith, and I live at 100 Piscataqua Road,
2 right in the area that we're talking about here.
3 And I'd like to begin, first of all, by thanking
4 you very much for how you are conducting this
5 hearing.

6 The Town of Durham has recently had an
7 opportunity to have a hearing with our local
8 public utility, and it was structured in such a
9 way that there was no interchange, no dynamic, and
10 that you were willing to answer questions as you
11 are and to listen speaks very well for the
12 Department's procedures, and I'd like to thank
13 you, and I'd like to begin with one question that
14 I just don't know the answer to.

15 Would the temporary bridge in that
16 right-hand design support the same weight as the
17 existing roadway?

18 MR. COTA: Yes, it would. We would
19 certainly design the bridge to accommodate the
20 legal -- legal load for Route 4.

21 MS. SMITH: Is the legal load the same as
22 the current?

23 MR. COTA: Yes.

1 MS. SMITH: All right. Thank you very
2 much for that. I have read the Ten-Year
3 Transportation Plans for the last 20 years, and I
4 remember when the Bunker Creek Bridge first came
5 into the Ten-Year Plan, and I remember how each
6 time a new Ten-Year Plan is adopted the year for
7 the Bunker Creek Bridge has crept slowly, slowly,
8 slowly into the future.

9 And I know why. It is because of the
10 availability of resources, not only state
11 resources but also federal resources. I know that
12 in the current budget, which has not yet been
13 agreed to, for the next biennium, those of you who
14 work for the Department of Transportation have to
15 have a pit in your stomach because of the
16 proposals initially in the House to basically cut
17 back the work of the Department of Transportation
18 to nothing except snow removal.

19 That's not what's going to end up, but
20 what will end up is not enough money to do all of
21 the essential things that you are so carefully
22 planning for. Therefore, nothing is more
23 important than for you to look at this project and

1 every other project in such a way as to keep the
2 cost as low as possible, not only the
3 environmental cost, which is very important, but
4 also the bottom line dollar cost. That is the
5 only way that this project and many others will
6 ever be constructed.

7 So to talk about a difference of
8 one-third in the cost, three million dollars to
9 four million dollars, and to even consider that
10 additional million must mean that there must be
11 really incredibly important reasons to expend that
12 extra money since it will either put off even
13 further into the future the realization of this
14 project or limit your ability to do other
15 projects.

16 And when you also know that the project
17 without the diversion would take about three
18 months as compared with 18 months, that, too, has
19 to be given very serious consideration. The net
20 cost in dollars and in time are very important.

21 I had occasion twice yesterday to drive
22 from Durham to Portsmouth. Actually I was going
23 to a doctor's office right next to the Portsmouth

1 Hospital. A trip that would ordinarily take me 15
2 minutes took me 55 minutes, five five, 40 minutes
3 more, almost four times as much, and that is
4 because of the interference with the free flow of
5 traffic because of the construction project that
6 has been going on ad nauseam in Newington.

7 To think that it is a fair comparison to
8 closing a bridge for no more than two weeks
9 compared with 18 months of interruption with
10 traffic no doubt slowed down just doesn't make
11 sense.

12 The world is not fair, and the world is
13 not perfect. If we are going to construct a new
14 bridge, which in time we will, although I'm not
15 sure it will be the time that you now anticipate,
16 then we ought to recognize that a very short
17 period of interruption is far preferable to a long
18 period of sporadic interruption, particularly when
19 we realize that the alternative is so damaging to
20 the ecology and to the environment of the people
21 who live -- who live nearby.

22 I would like to say that the comments
23 of -- of the McGregor people, of whom I have the

1 utmost respect, and for the fire chief and for the
2 Newmarket and Dover people were all prepared in
3 advance. And I wonder if they sat here and
4 listened and absorbed to the choices that were
5 laid out, if they might have a different response.

6 I also want to add my voice to the voice
7 of the Dover Police -- Dover Police representative
8 when he suggested that the closure should take
9 place when school is not in session. I think that
10 is a reasonable and responsible suggestion and one
11 that would definitely result in the least
12 interference certainly with school buses and
13 children being transported.

14 So, again, I'd like to thank you very
15 much for conducting this hearing. I hope that you
16 will, on the one hand, think of a total of three
17 months at three million on one hand versus 18
18 months and four million at the other with a
19 possible closure of up to two weeks and realize
20 that very clearly the merits lay on the side of
21 closing the road. Thank you again.

22 CHAIRMAN SPRAGUE: Thank you. Is there
23 anyone else in the audience?

1 MS. FORKEY: My name is Harriet Forkey.
2 I live at 104 Piscataqua Road with my husband,
3 Jere Lundholm. And I would like to second the
4 things that Jere and Loring and Marjie have just
5 shared here. I believe -- I'm not going to repeat
6 'em because I'm -- I totally support what they
7 have said. I would like to say a couple of other
8 things.

9 Having lived there for many, many years,
10 the noise from the road is very strong, and I'm
11 not sure what Marc was saying when he talked about
12 noise abatement, but I think whatever can be done
13 would be improve the living there because when you
14 go outside you cannot -- you cannot hear yourself
15 think. And I know some of these cement abutment
16 things can be put up, does attenuate the tire
17 noise. So whatever you can do in building that
18 would be very, very helpful from our point of
19 view.

20 I also commend -- am very pleased that
21 you are extending the side lanes. We do have a
22 lot of bicycle people. Jere and I still bike. We
23 do not bike up that end of Route 4 because it's

1 difficult even just walking across it. So if you
2 can do five feet or six feet or whatever you can.

3 And we think that this bridge is well
4 over 50 years old or more. It probably would be
5 another hundred years before you ever get another
6 chance. And to build anything in the state now
7 without good lanes for bicycles is ridiculous.

8 So I really reinforce doing what -- the
9 most we can. And more and more people are
10 walking. I also want to reiterate the speed limit
11 that Loring mentioned is that you have a lot of
12 traffic now because you have Wagon Hill that is
13 getting very popular. People are going up there
14 all the time walking, and you have people walking
15 on the road.

16 You also have Emery Farm, people trying
17 to go in there, and to have a 45 mile, which means
18 people are going 50, 55, doesn't make sense. And
19 I know at the time we looked at, four years ago,
20 in terms of alternate highway, the traffic was --
21 is just the same, probably even greater, and so
22 those issues, even though they're not in this
23 plan, they should be an overall context that

1 you're thinking of.

2 Let's see. There's one other question
3 that I was going to ask. Oh. I'm curious about
4 right here in the beginning when you were talking
5 about the -- raising the bridge three feet and
6 something about the 100-year point, Marc. And I
7 know that has to do with the level of how high the
8 water would be. What is that hundred-year -- what
9 does that refer to? What is it?

10 MR. COTA: John, can I ask you to
11 respond?

12 MR. BUTLER: Yes. Excuse me. The
13 100-year flood elevation is our estimation of how
14 high the water would be here underneath the bridge
15 in the event -- basically kind of a worst-case
16 scenario of a 100-year storm coming down Bunker
17 Creek combined with a seasonal high tide --

18 MS. FORKEY: Okay.

19 MR. BUTLER: -- from -- from the Oyster
20 River, and our estimate is that that is around
21 elevation 7.0, seven feet above --

22 MS. FORKEY: Okay.

23 MR. BUTLER: -- mean high tide.

1 MS. FORKEY: Okay. Just curious. Thank
2 you very much.

3 CHAIRMAN SPRAGUE: Thank you. Anyone
4 else wishing to speak?

5 MS. JOHNSON: I'm Deb Johnson. I want to
6 thank you all for all of the preparation that
7 you've done ahead of time. And everyone who has
8 spoken, everyone has been so eloquent. I won't be
9 so eloquent, and most of you stole all my thunder
10 as well, but I live at 112 Piscataqua Road. I'm
11 right next to Loring and Carol. I will be
12 impacted by this, but I'm not so much concerned
13 with what personally is going to happen to me as
14 what is going to happen to the wonderful wetlands
15 that are there if they build that temporary
16 bridge.

17 One of the questions that I have, and I'm
18 not sure whether you'll answer it or whether
19 you'll just mark it down and get us some answers,
20 but you talked about when you put this temporary
21 bridge in that there will be another seven-tenths
22 of an acre affected and that there would be fill
23 added to that.

1 And I wonder what is done after you put
2 that fill in for the temporary bridge, and you
3 take the temporary bridge out, what do they do to
4 take that fill back out? And what is left there
5 after or do they just leave it there, and it's
6 impacted forever?

7 You know, all those trees that they're
8 talking about taking -- taking down by the bypass
9 property and all of those other properties there,
10 yeah, I walk there every single day. There's a
11 beautiful forest there, and the stone wall, let
12 alone the eelgrass and all the wetlands there that
13 are going to be affected if they build that
14 temporary bridge.

15 I fully respect all of the emergency
16 personnel, all of the fire and police and the
17 concerns that they have, but it seems to me that
18 that two-week window is a very short window of
19 impact versus what Marjorie went through
20 yesterday, the 55 minutes to get to her doctor's
21 appointment. For 18 months we're going to deal
22 with that, let alone what we're dealing with with
23 all of the other bridge constructions that are

1 going on now.

2 Two weeks is a short time, and I remember
3 that 2013 proposal when the engineers at UNH
4 Engineering Department was very involved in that,
5 and it was wonderful. We thought it was all
6 fixed. We thought it wasn't just going to be this
7 two-week closure, and there wasn't going to be
8 this temporary bridge, but it was a big surprise
9 to a lot of us to see that oh, this plan is back
10 on. We're going to do this huge impact and that
11 those engineers at that time told us about the
12 Epping bridge that they worked on and how that was
13 far less than the anticipated time that they had.
14 They did it in under two weeks, and it went very
15 smoothly, so I would just love to see them go back
16 to that.

17 And I'm totally in favor of the two-week
18 closure, and I will pray for -- that there are no
19 emergencies that will be affected in that two
20 weeks, but I think that the impact of 18 months is
21 going to be much longer. So thank you all very
22 much.

23 CHAIMAN SPRAGUE: Thank you. Is there

1 anyone else in the audience wishing to speak
2 tonight? Going once. There being no indication
3 of anyone remaining who desires to be heard, this
4 hearing is adjourned. The hearing adjourned at
5 8:40.

6 (The hearing is adjourned at 8:40 p.m.)
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THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION



WILLIAM CASS, P.E.
ASSISTANT COMMISSIONER

June 5, 2015

Durham
X-A000(202)
16236
[US Rte. 4/ Bunker Creek Bridge Replacement]

Bureau of Highway Design
Room 200
Tel: (603) 271-2171
Fax: (603) 271-7025

William Cote
Executive Director
McGregor Memorial EMS
47 College Road
Durham, NH 03824

Dear Mr. Cote:

On behalf of William Cass, Assistant Commissioner, I would like to acknowledge your letter of May 28, 2015 in reference to the Department's proposal for the replacement of the US Rt. 4 Bunker Creek Bridge in the Town of Durham.

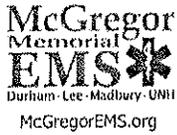
Your emergency response concerns for short-term road closure will be included in the official transcript of the Public Hearing, and will receive the consideration of the Hearing Commission.

Sincerely,

Keith A. Cota, P.E.
Project Manager

KAC/kac

cc: William Cass, Assistant Commissioner
Chuck Schmidt, Administrator, Bureau of Right of Way
John Butler, Preliminary Design, Bureau of Highway Design
Commission Members
Chairperson Dale Sprague
George Rief
Thomas Richardson



TEL: 603.862.3674
FAX: 603.862.4415

McGregor Memorial EMS

formerly Durham Ambulance Corps
"Committed to Compassionate Excellence"

Bill Cote
Executive Director
bcote@mcgregorems.org



McGregorInstitute.net
47 COLLEGE RD
DURHAM, NH 03824

May 28, 2015

RE: Durham #16236 X-A001(202)

Mr. Dale Sprague, Commission Chair

Dear Mr. Sprague:

The following was read into the minutes at the public hearing at the Durham Town Hall on May 28, 2015:

McGregor Memorial EMS is a regional emergency ambulance service serving the communities of Durham, Lee, Madbury and the University of New Hampshire. Many patients are transported to Portsmouth Regional Hospital (PRH) by McGregor EMS every week. Portsmouth offers a number of clinical services unavailable at other hospitals in the area. For example, Portsmouth is the only Level II Trauma Center on the Seacoast and the only facility on the Seacoast capable of performing open-heart surgery. As a result they receive some of the most seriously ill or injured patients we encounter. It is our understanding that in replacing the bridge over Bunker Creek on Route 4 in Durham that the DOT plans to close the road entirely for 2 weeks or longer. We have very serious concerns over this decision for numerous reasons:

1. There are many residences, farms and recreational areas east of the project and road closure would preclude our access to them in a timely fashion. While one may posit that either Dover or Newington ambulances could serve this area, quite frequently Dover is unavailable due to their call volume and Newington could also be committed to a simultaneous call. In either case, a significant delay in accessing a patient would occur and additional load will be placed on our neighbors. McGregor cannot stage an ambulance east of the project as this impacts our operational capabilities for the remaining communities and no suitable facility exists to house an ambulance and crew.
2. As PRH is the only Level II Trauma Center on the Seacoast, critically injured patient(s) are transported to this facility. The State of New Hampshire Patient Care Protocols stress transporting trauma patients to a designated Level I or Level II Trauma Center to ensure that patients receive the specialized care they need as rapidly as possible. As with many serious medical emergencies time is critical, extending the time that it takes for these patients to arrive can place patients at greater risk of death or serious disability.

THE STATE OF NEW HAMPSHIRE
DEPT. OF TRANSPORTATION

JUN 03 2015

COMMISSIONERS OFFICE
RECEIVED

McGregor Memorial EMS

3. Time trials for various transport routes to PRH were conducted and shown here in this chart:

Transport times to Portsmouth Regional Hospital

Starting Location	Route Traveled	Time	Difference
Durham Town Hall	Route 4	15 minutes	-
Durham Town Hall	Route Rt 108 to Rt 16	22 minutes	7 minutes
Durham Town Hall	Route 108 to Rt 33	29 minutes	14 minutes

These trials were performed using Durham Town Hall as a common and familiar starting point and traveling during off-peak traffic without lights or sirens. Many studies have shown that the amount of time saved through the use of lights and sirens is small. As such we believe that the small amount of time that may be saved transporting lights and sirens would be inadequate to compensate for the additional traffic congestion caused by a Route 4 closure.

4. Our ability to respond to emergencies beyond the closure will also be negatively impacted. To demonstrate this additional time trials were performed coming from the McGregor EMS Station (next to the Durham Fire Station) to a common and well know location, in the case Wagon Hill.

Response times to Wagon Hill from McGregor EMS and Durham Fire Stations

Starting Location	Route Traveled	Time	Difference
McGregor EMS/Durham FD	Rt 4	7 minutes	-
McGregor EMS/Durham FD	Rt 108 to Mast Rd. Rd. (Dover) to Spruce Ln (Dover) to Piscataqua Rd. (Dover) to Back River Rd. (Durham) to Rt 4	16 minutes	9 minutes

These trials were performed in a similar manner to the Portsmouth time trials.

To the average driver a delay of 7, 9, or even 15 minutes is an inconvenience and even an annoyance. To the patient who has a serious traumatic injury or is suffering a heart attack this additional time can have a significant impact on not just their ability to recover but also sometimes their ability to even survive.

McGregor Memorial EMS respectfully requests that NHDOT provide a temporary bridge capable of carrying all emergency vehicles. The residents and visitors to our communities as well as the traveling public deserve the best emergency care possible.

Respectfully submitted,



William Cote
Executive Director



THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION



WILLIAM CASS, P.E.
ASSISTANT COMMISSIONER

June 5, 2015

Durham
X-A000(202)
16236
[US Rte. 4/ Bunker Creek Bridge Replacement]

Bureau of Highway Design
Room 200
Tel: (603) 271-2171
Fax: (603) 271-7025

Paul D. Chamberlin, PE
Associate Vice President, Facilities
Ritzman Lab
22 Colovos Road
Durham, NH 03824-3515

Dear Mr. Chamberlin:

On behalf of William Cass, Assistant Commissioner, I would like to acknowledge your letter of May 27, 2015 in reference to the Department's proposal for the replacement of the US Rt. 4 Bunker Creek Bridge in the Town of Durham.

Your support for short-term road closure will be included in the official transcript of the Public Hearing, and will receive the consideration of the Hearing Commission.

Sincerely,

Keith A. Cota, P.E.
Project Manager

KAC/kac

cc: William Cass, Assistant Commissioner
Chuck Schmidt, Administrator, Bureau of Right of Way
John Butler, Preliminary Design, Bureau of Highway Design
Commission Members
Chairperson Dale Sprague
George Rief
Thomas Richardson



University of
New Hampshire

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COMMISSIONERS OFFICE

JUN 01 2015

May 27, 2015

THE STATE OF NEW HAMPSHIRE
DEPT. OF TRANSPORTATION

Facilities
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www.unh.edu/facilities

William Cass, PE, Acting Commissioner and Chair of the Commission
New Hampshire Department of Transportation
PO Box 483
Concord, New Hampshire 03302-0483

Re: US 4 Bunker Creek Bridge Replacement (NHDOT # 16236)

Dear Commissioner Cass:

The University of New Hampshire appreciates the opportunity to provide input to the public hearing on this bridge replacement project on US 4 in Durham.

We share the view that it is in the best interest of the state to complete the project in the most expedient, cost effective and least environmentally impacting manner and understand that the work may require temporary closures or restrictions on US 4 through the area.

We have discussed the issue with our Wildcat Transit operator, University Transportation Services, and they are willing and able to continue transit service using a detour of NH 108 to Spaulding Turnpike when necessary. We currently provide such alternate routing during extreme backups on US4 and we have the ability to provide that information to our riders using our messaging systems.

We would strongly suggest, for the benefit of the UNH and regional community, that work on the Bunker Creek bridge commence no sooner than the week after UNH Commencement (typically in May) and continue no later than one week prior to UNH scheduled 'move-in' day in late August. These two days are two of the largest traffic peak days of the year on that road segment. Similarly, it would be very challenging to adapt to any traffic limitations during the academic year and we would hope that could be avoided.

The Campus Planning staff will be happy to work with you on specific schedule planning as the time for actual construction nears.

Sincerely,

Paul D. Chamberlin, PE
Associate Vice President, Facilities

Cc: Dirk Timmons, University Transportation Services
Douglas Bencks, Campus Planning



THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION



WILLIAM CASS, P.E.
ASSISTANT COMMISSIONER

June 10, 2015

Durham
X-A000(202)
16236
[US Rte. 4/ Bunker Creek Bridge Replacement]

Bureau of Highway Design
Room 200
Tel: (603) 271-2171
Fax: (603) 271-7025

Marjorie Smith
P.O. Box 136
Durham, NH 03824

Dear Ms. Smith:

On behalf of William Cass, Assistant Commissioner, I would like to acknowledge your letter of June 3, 2015 in reference to the Department's proposal for the replacement of the US Rt. 4 Bunker Creek Bridge in the Town of Durham.

The 1926 study entitled "An Ecological Study of the Brackish-Water Stream" will be included in the official transcript of the Public Hearing, and will receive the consideration of the Hearing Commission, as well as, your support for short-term road closure.

Sincerely,

A handwritten signature in black ink that reads "Keith A. Cota".

Keith A. Cota, P.E.
Project Manager

KAC/kac

cc: William Cass, Assistant Commissioner
Chuck Schmidt, Administrator, Bureau of Right of Way
John Butler, Preliminary Design, Bureau of Highway Design
Commission Members
Chairperson Dale Sprague
George Rief
Thomas Richardson

Marjorie Smith
PO Box 136
Durham, NH 03824

June 1, 2015

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JUN 0 7 2015

THE STATE OF NEW HAMPSHIRE
DEPT. OF TRANSPORTATION

Dale Sprague, Chair
c/o William Cass 
Director of Project Development
NH DOT
PO Box 483
Concord, NH 03302-0483

Dear Mr. Sprague,

This is to follow up on the oral testimony I presented at the May 28th hearing concerning the Bunker Creek Bridge. Thank you again for the thoroughness of the presentation and the courtesy you extended to those of us who appeared before you

Attached to this letter you will find a document published in 1926, "An Ecological Study of a Brackish-Water Stream" that discusses in detail the fragile ecological balance of Bunker's (sic) Creek, and the Great Bay estuarine system that is so important to our environment.

The thoughts expressed in scientific terms almost ninety years ago are even more relevant now as the ecological systems are taking a literal and figurative beating.

It is because of the fragility of the ecological system, not to mention economic realities, that I will summarize here some of the major points made by those of us who testified. I expect that you have read the transcript that includes discussion of many of these points.

Those of us whose travels require us to experience the never-ending construction morass over the Piscataqua River heading to Portsmouth could not responsibly favor keeping a construction project going six times as long as necessary.

I am sorry that the Durham Fire Chief and the head of the McGregor Ambulance Corps delivered their prepared testimony and left before hearing more details of the alternative that would not require a diversion bridge and, therefore also not require the taking of private land, the destruction of many trees and of an historic stone wall, the disturbance of wetlands that would necessitate compensation, and other permanent damage to the environment.

Naturally no one desires an interruption of access for fire and ambulance vehicles. However, the alternative plan would require shutting the road for no more than two weeks – and possibly only one week. That plan, developed with the skilled involvement of UNH faculty and graduate students, uses an accelerated bridge construction model with the least damage to the environment, least cost and least inconvenience and delay to all users of the road.

It is hard to imagine a trucker who would not rather incur a week or so of a detour instead of eighteen months of delay and interference. Mr. Coty stated that only Portsmouth Hospital could perform open heart surgery, and the ten minutes in additional travel time needed because of a short-time detour could be life threatening. I am sure Mr. Coty thought that it would be his strongest argument, but if one takes a moment to think about it, it is highly unlikely that an EMT in an ambulance would be making a determination that open heart surgery is necessary. The likelihood is that such a decision would be made in a hospital, and closing Bunker Creek for a week would not be a factor in traveling from, for example, Wentworth Douglass to Portsmouth.

I urge you to reject the alternative that would require construction of a diversion bridge. Such a bridge would increase the cost of the project by one-third, and increase the predicted time of the entire project from three months to eighteen months. Neither is justifiable. We all understand the limited funds available for essential road and bridge work in this state and if an alternative exists that meets all safety and other requirements that is less costly in money and in time we are honor-bound to pursue that.

I also repeat my support of the Dover Police Department's suggestion that the road closure be timed during the summer so as not to interfere with school buses.

The one part of the department's presentation that I feel less confident was the environmental impact. I alluded above to the destruction of the physical environment that a diversion bridge would cause. I would have liked to know more about the reference to noise. I am not a scientist nor an engineer, but understanding basic principles of how sound travels, particularly over water; I would suggest that if the height of the bridge is raised, there would be a concomitant increase in noise amplified across the river.

Using the 100 year flood standard that the department noted, I am not convinced that any increase in height is necessary. When one also realizes that an increase of three feet would result in the bridge being lengthened from fifteen feet to sixty feet that should give all of us pause. Widening the opening from the Oyster River to Bunker Creek by that much will necessarily result in significant disturbance of the ecological balance of the creek.

If the department wants to lessen the slope of the hill, a much more sound approach would be to cut down the height of the knoll. As I understand it, only one boring has been completed and that showed ledge about 12 feet below the road surface. I would hope that additional borings would demonstrate that the height of the knoll could be decreased significantly and thereby eliminate or dramatically lessen the need to increase the height of the bridge.

Many years ago NH DOT received praise for their work on the Route 108 bridge over the Oyster River. The proposed Bunker Creek Bridge offers the department to once again be praised for construction of an economically and environmentally desirable plan

Thank you for your consideration.

Margorie K. Smith

Attachment



Promoting the Science of Ecology

An Ecological Study of a Brackish-Water Stream

Author(s): C. H. Batchelder

Reviewed work(s):

Source: *Ecology*, Vol. 7, No. 1 (Jan., 1926), pp. 55-71

Published by: Ecological Society of America

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AN ECOLOGICAL STUDY OF A BRACKISH-WATER STREAM

C. H. BATCHELDER

Cornell University

The coves and inlets and the brackish-water creeks along shore are the pantry shelf of the ocean. Migrant crustaceans, as well as schools of fish invade these waters to feed upon the small fry which in turn get their living in the brackish-water channels and tide-pools where life abounds. There, food is plentiful and a floor exists for the footed forms to crawl upon and shelter for the footless ones to hide in, while others perch above the floor to fish their food out of passing waters. So the swimmers eat the crawlers and the crawlers seek out both the hidiers and the fishers and these could live nowhere else except on the pantry shelf.

It is here, then, in the brackish-water area that one may find for study an abundance and variety of forms living under a variety of environmental conditions. This report deals with such a study. It summarizes ecological data, describes habitats and their tenants and takes note of the relations of inhabitants to each other and to their environment as expressed in their strife, shift and succession. The brackish waters offer a variety of conditions with extremes of temperature and density, a wide choice of food materials, a diversity of bottom topography, a great range of depth, a variety of weed and rock protected shelters, an abundance of sunlight or shade, and an opportunity for exposure to a terrestrial substratum. How, then, is the brackish-water fauna distributed with relation to these things?

BUNKER'S CREEK

The area selected for study seems very well adapted for the purpose, presenting in miniature all the phenomena characteristic of the larger bodies of partly fresh and partly salt water. Bunker's Creek breaks through the north bank of Oyster River, a tributary of Great Bay in Durham, New Hampshire. It has yielded a remarkably rich fauna, accessible throughout the year, sufficiently diverse, and typical of the tidewater bays and inlets of the northern New England coast. "Bunker's Creek" includes nine and one half acres of brackish water at full tide, receiving its supply of fresh water from two brooks and its salt water from the ocean at Portsmouth. The tide reaches Oyster River and Bunker's Creek, however, via. Piscataqua River and Great Bay which is seven miles long and four miles across at its greatest width. Into this bay three rivers empty fresh water. This makes of Great Bay an enormous mixing-tank resulting in lower densities and daily and tidal changes in the temperature. When the tide reaches Bunker's Creek, then, even in times

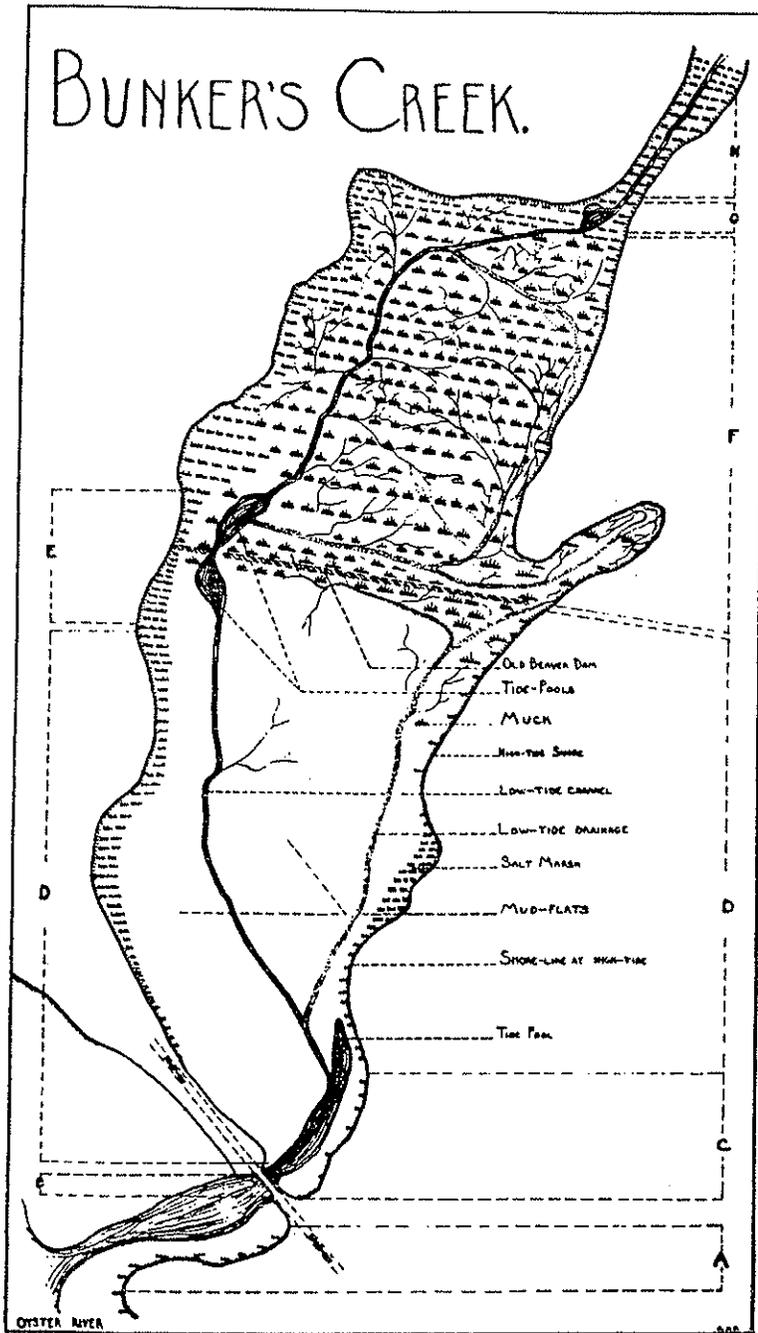


FIG. 1. Bunker's Creek, a tributary of Oyster River which flows into Great Bay, New Hampshire. Letters show stations mentioned in the text.

of severe drought, the density is lower than sea-water, and spring rains profoundly affect the physical condition of the tide waters that pass through the bay. It should be noted that Piscataqua River and Great Bay present a barrier to sessile animals that cannot withstand a medium of reduced density and prevent those more mobile forms of marine origin from obtaining a

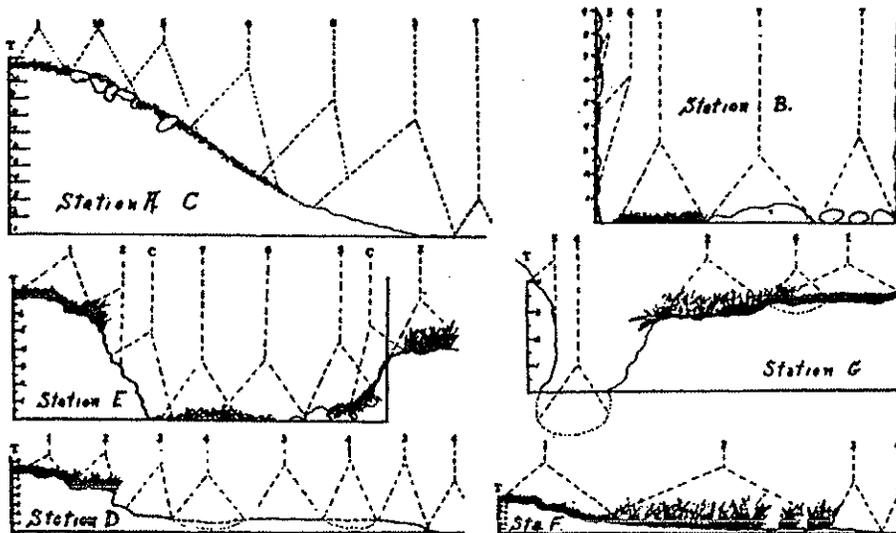


FIG. 2. Sections of Bunker's Creek: structure of the substratum. T, scale in feet to high-tide level. Numbers along top of each station diagram: 1, salt marsh border; 2, *Spartina* muck; 3, mud; 4, tide-pool; 5, shore-stones; 6, *Fucus* sp. and *Ascophylum* sp.; 7, bottom debris; 8, lower sand belt; 9, gravel; 10, shore-boulders. For location of stations see Fig. 1.

permanent residence in upstream communities. Bunker's Creek emerges from a ravine between two hills of intrusive granite. This is the origin of the pebbles and stones and the scattered boulders which are everywhere abundant in this locality and which give rise in turn to the sediments deposited on the flood plains of the stream's lower course. This is the first characteristic of a brackish-water stream, its sediments are of fresh-water origin and its salinity is born of the ocean.

Intensive studies were made of the communities along the course of this stream, where density and temperature determinations were made, bottom materials sampled and the inhabitants living under those conditions listed. A comparison of the populations reveals the selective influence of several physical factors, a discussion of which appears subsequently. These communities are rather definitely distributed with respect to substratum, falling into either an eroding-shore or a depositing-shore group. Along the creek from mouth to headwaters they have been designated as eroding-shore com-

munities (or collecting stations); *A, B, C, E, G*, and as depositing-shore communities: *D, F, H*. Field collections were also cataloged with reference to the surface materials; muck, mud, sand, gravel, stones, boulders and types of vegetation. Cross-section diagrams of Bunker's Creek at several stations (Fig. 2) illustrate the distribution of these materials from channel or tide pool to the high-tide shore. Finally, tabulation and qualitative study of the inhabitants indicates the existence of the following associations (distributed with relation to surface materials) along the course of Bunker's Creek:

1. Associations of eroding-shore communities:

- The shore-stone association.
- The fucus-ascophylum association.
- The lower sand-belt association.
- The bottom-debris association.
- The tide pool-channel.

2. Associations of the depositing-shore communities:

- The border-marsh association.
- The mud-flats association.
- The muck-flats association.

While these habitats are somewhat overlapping, one has little difficulty in distinguishing between them. Reference to the distribution table appended herewith reveals the complete list of community inhabitants.

ERODING-SHORE COMMUNITIES

The conditions of life at station *A*, an eroding-shore community at the mouth of the creek, are more constant throughout the year than other stations both as regards temperature and density, since mixture of the waters has usually occurred above or below this point. A wide choice of surface materials is offered and a long slope affords the satisfaction of individual preference as to depth and amount of exposure. As might be expected it is populated with various groups which distribute themselves among the channel, mud-flat, lower sand-belt, fucus-ascophylum, shore-stone and border-marsh associations.

Station *B*, also includes a group of eroding-shore associations living, however, under the artificial conditions presented by a bridge. This tide-passage is 20 feet through, 15 feet wide and 12 feet deep. All of the water of both the incoming and the outgoing tides must flow through this passage, and the current is sufficiently strong to keep it free of ice in winter. This insures an abundance of food and oxygen for those sessile forms equipped to withstand the current. Extremes of density are not as radical as at the communities upstream, since ample opportunity is presented for mixing the waters as pools

are encountered by the outgoing tide. The community is analogous to the ledges and shore-stones of a river bank. It includes the following: bottom debris, fucus-ascophylum, and shore-stone associations.

The associations of station *C* are identical with those of station *A*, and the conditions of life are much the same except that the influence of slightly reduced density is felt and the tide drop is 2 feet less. The two stations are separated by the bridge pier that forms the tide-passage of station *B*.

Another community of the eroding-shore type but of artificial origin occurs where the channel breaks through a beaver dam about 300 yards upstream from station *C*. The old beaver dam forms a barrier and the break in it is a tide-passage similar to that of station *B*. Before either tide reaches the passage it must flow over or through a tide pool and these offer a harbor of refuge both during the low-tide interval and during the winter months. The physical conditions obtaining in this community are similar to those of the preceding eroding-shore type in that there is sufficient current to scour bottom materials, the temperature range is about the same, the bottom materials are the same and the exposure is identical. These differences are to be noted; the density range is greater, a much smaller amount of water passes this point, upstream muck-flats have robbed the outgoing tide waters of oxygen, and the water-transported supply of elementary food is greatly reduced. One finds here the bottom-debris, fucus-ascophylum, shore-stone, muck-flat and the border-marsh associations.

Station *G*, located 200 yards upstream from station *E*, is a community immediately adjacent to and including the last tide-pool in the course of the stream, and nearest the fresh water source. From this fact it assumes considerable importance, for it is the highest point at which the distribution of several forms is possible. Except during the coldest periods the pool is open during the winter months, but no life remains there through this season, possibly because there are no migrating forms above this point to move into it. Severe restrictions are imposed by the physical conditions obtaining in this community. Temperature fluctuates as tide-water or brook-water flows through it, the density range is greater than at any other point along the stream, due to the high elevation, the tide current is maintained for a very brief interval and the food and oxygen content of its tide-water has been for the most part extracted by the animals and plants of the downstream communities. However, the following somewhat depopulated groups may be found there: bottom-debris, shore-stone, permanent tide-pool, muck-flat and the border-marsh associations.

DEPOSITING-SHORE COMMUNITIES

Station *D*, embraces about one thousand square yards of mud-flats extending between stations *C* and *E*. This is very black with decaying organic matter, very soft from its capacity of holding a relatively high water content

and almost devoid of the larger marine algae, only some of the Ulvacea being present. Exposure extends over a long period of time during the low water interval and the community is also subjected during the half-tide phase to fluctuation in the density. Extremes of temperature prevail. The area is covered with ice in winter, and in summer the diurnal extremes are wide owing to long exposure to sun and air. Many forms of life successfully invade the mud-flats during the high-tide interval, and life is abundant there at any time but the species list of permanent residents is limited. *Nassa obsoleta*, the "mud snail" roves about over the surface in great numbers all summer, the edible clam, *Mya arenaria*, lives in communication with the surface in prodigious abundance and the annelid worms, *Nereis virens* and *Noto-mastus filiformis*, inhabit the lower levels. Stranded crabs, isopods and amphipods are often taken at the surface during low tide. But no forms are found there that are not also inhabitants of other surface materials in eroding-shore communities. For instance, not all parts of the mud-flats are inhabited by clams, and the animals apparently grow as well in sand or gravel or under stones providing food is available. The forms appear to be well protected from density extremes and natural enemies, but it is apparent that they are abundant because of food resources. The groups found in this community include the temporary tide-pool, mud-flats, muck-flats and border-marsh associations.

The inhabitants of the muck-flat community, station *F*, are the most highly specialized of the entire area. The surface material is a very soft, oozy, muck of decaying organic matter and a very small amount of silt. It is so soft and so deep that it defies examination except from a boat in summer and through the ice in winter. The old beaver-dam interposed between this community and the mud-flats of station *D* effectively nullifies the natural influence of the wind and tides, so that, although wave action is reduced, sedimentation is at a maximum. In places, the *Spartina* sedge supporting itself on a mass of interlacing roots, creeps out over the surface and here and there forms tiny islets. Two associations are found here, the muck-flats and the border-marsh.

CONDITIONS OF EXISTENCE IN BUNKER'S CREEK

The inhabitants of the brackish-water areas are subject to the influence of several important environmental conditions which are intensified in this division of the littoral. These may be set down as the character of the food, the nature of the substratum, intertidal changes in the condition of the water, and variation of the temperature. This combination is unique. No other environment presents at once conditions of existence comparable with it. Yet life is abundant even though tidal and seasonal changes affect the inhabitants during long exposure at low tide when there is no escape from winter ice or the summer sun. High tide is dinner hour for the fish and

crabs, and low water is the feeding time of birds. Although everywhere important, these factors are present in varying combinations. Thus, mud is the most important element in the life-history of some forms, rocks in others, and water currents are essential to some species. Temperature is important to certain animals which withstand density changes. The oyster must have clear water. *Macoma balthica*, the "muck-clam," being round, must have the soft ooze in which *Orchestia*, the amphipod, becomes mired. The tube-worms are little affected by temperature but must have materials for their abode, and so on.

PLANT LIFE

The least measurable of these factors is the plant life of the region. Diatoms and unicellular algae are found in the muds. A plancton-flora floats in with the tides. At other phases of the tide it covers the fucus growths and the rocks. It provides a constant supply to the herbivores. So, countless lamellibranchs protrude siphons or open valves to receive a constant stream of food-laden water while univalves scrape the fucus filaments with their tiny radulae for the tidal food-film that has been left there.

Consideration of the vegetation has been limited to its general distribution in the course of the stream. *Fucus vesiculosus* fringes the lower shore-bowlders whenever they are exposed between tide limits. In these situations they serve as protection as well as store-houses of food for a very characteristic community of animals. Associated with *Fucus* growths, very often, is *Ascophyllum* sp. which also inhabits the exposed shores from the channel to a higher point in the littoral zone. Several species of *Ulva*, *Enteromorpha* and *Monostroma* frequent the areas exposed at low tide. *Ulva* seems to have the widest distribution, being found in the last tide pool on the course of the stream at station *G*. Species of *Lyngbya* cover the bottom of the salt pools characteristic of the salt march areas. The "eel grass," *Zostera marina*, inhabits situations in the channel where depth and mud bottom allow it. It occurs notably at station *A* in the channel; at station *C* in the tide pool, and at station *E* in both tide pools. The marsh sedge, *Spartina*, is widely distributed, being especially characteristic of the muck-flats of station *F* where it covers the area with a luxuriant growth. It is also found in the border of vegetation surrounding the entire course of the stream occurring wherever there is soft, oozy mud. It is always partly covered at high tide and is fringed toward the land with the salt meadow grasses, *Sclerochloa maritima*, *S. distans*, etc. This "black grass" besides fringing the stream banks is the important vegetable growth of the salt marshes.

THE NATURE OF THE SURFACE MATERIALS

The substratum is a place to hide in, to cling to, to lay eggs in, to scrape food from, to crawl over, to burrow in, to fish from and sometimes it is a thing to be eaten. The substratum is the most striking physical factor of

almost any environment. It can be seen, dug into, smelled of, and otherwise examined. It is so obvious that one is led to adopt a nomenclature of surface materials in naming habitats. One is tempted to see in the bottom materials an all important factor governing the distribution of the inhabitants. The temptation is misleading. This is especially true in an intertidal zone where much information must be sought during the low-tide interval, at which time many forms have ceased their usual activities. Surprisingly few animals in a brackish-water habitat are restricted to peculiar types of surface materials. The sessile forms as the sponge, *Cliona sulphurea*, the Hydroids, and the barnacle, *B. improvisus*, prefer a hard and stable surface but many things may be accepted as substitutes. No forms are found in the mud-flats that are not also found in sand or gravel. The most highly specialized form is the "muck-clam," *Macoma balthica*, which is restricted to the muck areas.

THE TIDES

One of the most conspicuous features of a brackish-water environment is the tidal changes in the level of the surrounding medium. These changes cause a constant succession of exposure, first to a terrestrial existence, and then to a semi-marine mode of life. Some of the brackish-water animals have adapted themselves to a semiterrestrial existence as *Littorina rudis*, which even retreats before the incoming tide. But the physical factors of a brackish-water environment are inseparably connected with the tides. Surface materials are moved by the tides, vegetation is fed by the tides, the temperature of the water during most of the year and part of the day is determined by the tides, and finally the tides alter the shore topography wherever the water meets the land.

There is considerable difference in the depth to which the tide falls in the various stations of the survey. This is due to the differences in the level of the channel bottom. Now, as is well known, "spring tides" rise to higher levels than "neap tides"; but in all stations except station *A*, all low tides leave complete exposure due to a drop in the level of the channel-bottom occurring between stations *A* and *B*. The result of this difference in level is noteworthy. Not only are several important points in each of the stations of the lower part of the stream treated to longer submergence but the channels of the upper part of the stream contain water whose origin is not tidal but flows down from the brooks. This influences the density of the channel-water, and, were it not for the numerous tide-pools along the course of the stream, there would be far greater and more unlivable extremes than actually prevail.

THE DENSITY

Among the important changes wrought by the tides are those inaugurated by the incessant cycle of densities. These density changes are peculiar to the

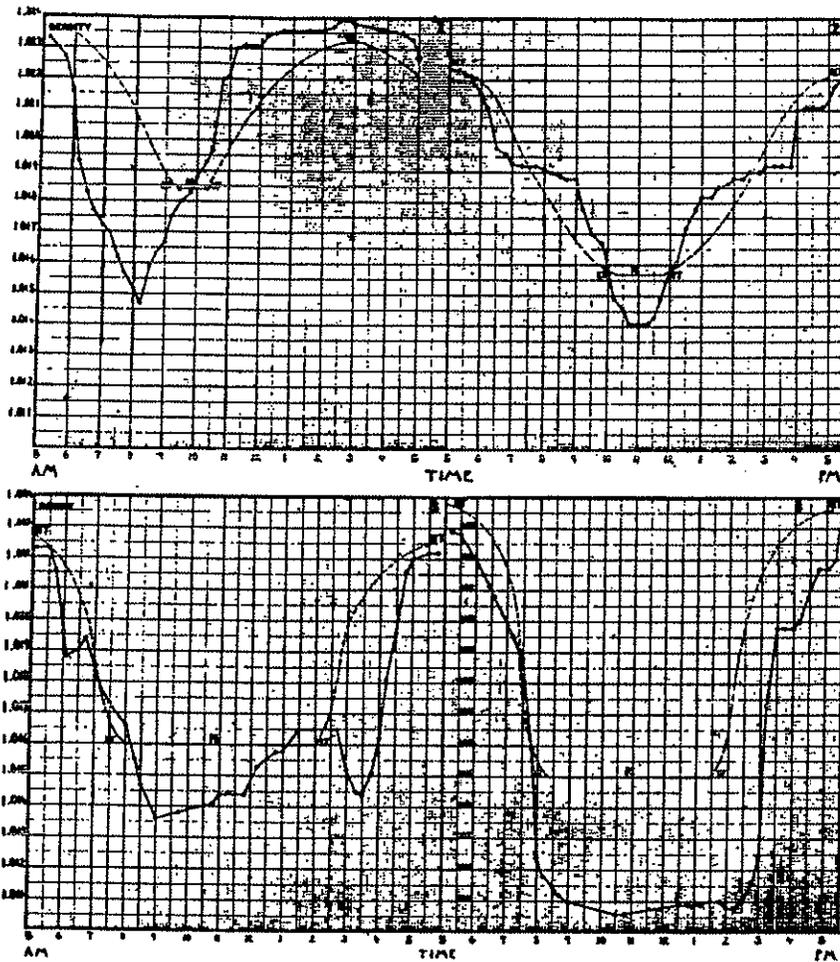


FIG. 3. The tidal and seasonal density range in Bunker's Creek. These density-time curves show typical cycles occurring during annual periods of minimum and maximum dilution of tide-water at two points on the course of the stream. Features represented: *HT*, high tide; *PE*, period of complete exposure (channel elevation is above low-tide level during this interval); *HT-LT*, period of outgoing tide; *IT-HT*, period of incoming tide; tidal periods are indicated by a broken line.

CHART 1. Station B. Intertidal density cycle prevailing during the late-fall period of drought and minimum dilution. Water temperature, 7.8° to 8.2° C. CHART 2. Station B. Intertidal density cycle prevailing during the late-winter period on a day of melting snow and ice when dilution of tide-water was considered to be at a maximum. Water temperature, 0° to 0.1° C.

CHART 3. Station G. Intertidal density cycle prevailing during the late-fall period of drought and minimum dilution. Water temperature, 12.5° to 17.5° C. CHART 4. Station G. Intertidal density cycle prevailing during the late-winter period on a day of melting snow and ice when dilution was considered to be at a maximum. Water temperature, 0° to 0.1° C.

brackish waters. The intertidal and seasonal range of the density occurring at two points on the course of the stream are presented in figure 3. The charts in this figure represent the changes in density under what were considered average conditions for that season of the year. These density-tide-time curves illustrate diagrammatically the wide range of extremes prevailing seasonally and also during the complete cycle of the intertidal interval. At the same time, exceptional opportunity was offered for the study of the intertidal changes of the water in the tide pool at station *G* which is located near the upper limit of tidal influence. It was found here that there is a very abrupt decline in the density when the tide begins to run off. This rapid drop is probably explained by the fact that water of reduced density had already passed by this point and that lighter surface strata slip off over the heavier water beneath. Shortly, however, the decline becomes less rapid and then rises again during the low-tide interval. The incoming tide at first pushes beneath the current flowing down stream, but the latter suffers gradual diminution and finally disappears. The early phase of the incoming tide registers a decline in its density due to the fact that recently mixed waters that have just passed down stream are backed up again. This is succeeded by a rapid increase in density until the high tide period is reached. The period of complete exposure during the low-tide interval is very long at this station owing to its elevation. But the density of the lower strata of water in the tide pool is reduced very gradually. It is apparent that the fresher water originating from the spring brooks increases in density during its passage through the marsh channel of station *H*. It then flows over the surface of the tide pool of station *G* leaving diffusion as it passes. Diffusion is so slow, however, that complete mixture is never attained, and, while the diffusion line gradually falls, it never reaches the bottom of the pool before recurrence of an incoming phase of the tide. This leaves a considerable body of water in the bottom of the pool which retains relatively higher density and above which is a line of diffusion separating it from a surface layer of comparatively fresh water.

The density determinations were obtained from salinometers previously tested by the Bureau of Standards. Density determinations were accompanied by careful observations of the temperature and reductions made to the prevailing temperatures. In this matter a departure has been undertaken. If 15° C. was taken as the general temperature the exact prevailing condition of the water would not be given. Hence my figures represent the density at the temperature prevailing when the reading was taken. Although differences were observed between the densities of the surface and the body of water in the stream it was considered impractical to construct tables for them.

The readings obtained from fall and winter determinations when the highest and lowest densities prevail, indicate the following observations:

1. The highest recorded density is 1.024 taken at station *B*.

2. The lowest density, found at station *I*, was 1.0002.
3. The greatest extremes are recorded from station *G*, being from 1.00060 to 1.013.
4. There is everywhere a much greater variation in density than is recorded from the off-shore North Atlantic density of 1.028 to 1.027 or the prevailing in-shore variation of 1.0212 to 1.0244.

5. The rise and fall of the brackish-water densities occurs in cycles correlated with the daily tides, but the extent of the variation is greatly influenced by the periodic lunar-month spring and neap tides. In addition, an annual cycle occurs in which the highest densities are recorded in the late-summer-early-fall period of drought, and the lowest densities occur during the period of the spring run-off.

The effect of these cycles of density upon the distribution of the animal inhabitants of Bunker's Creek, as far as could be observed, may be summarized as follows:

1. None of the adult animals habitually live under circumstances such that they are seriously inconvenienced by greatly reduced densities.
 2. Some of the forms react to changes in the density, such as:
 - (a) Sessile forms, which modify their habits to meet fluctuations in the density.
 - (b) Those more mobile forms, which escape into situations where more favorable densities prevail.
 3. Some forms exhibit no pronounced reaction to density changes, as:
 - (a) Forms especially equipped for overcoming the effects of the change.
 - (b) Animals whose habitat does not subject them to great extremes of density.
- The statement that none of the animals are seriously affected by low densities is self-evident; if seriously inconvenienced they would turn back upon meeting a medium of reduced density before reaching the brackish-water areas. But most of the brackish-water animals are forced to react to changes in the density by either shifting to another location within the area or by ceasing activity until the tide comes in again. The more sessile forms of life which inhabit a rather restricted area are subjected to higher densities as the tide rises over them, and to reduced densities as the tide flows out. Examples of this type of life and habitat are seen in the barnacles, several molluscs including the edible "little-neck" clam *Mya arenaria*, and several species of hydroids. All of these withdraw their siphons or close their shell very tightly or otherwise cease activity, thus escaping possible deleterious effect of exposure to reduced density. Some of the more mobile inhabitants of the brackish-water areas habitually escape reduced densities, not by resorting to a condition of dormancy or through radical physiological adjustment but by simply shifting during ebb tide to similar but deeper water. Thus, flounders, minnows, crabs, shrimps, amphipods and others gradually move with the tide as it deserts the shore line and recedes across the flats until there is left only

a basin or two in the mud flats depressions, and the tide pools along the channel course. The shallow basins on the mud flats retain the density of the water, as left by the retreating tide, and their hospitality is accepted by numerous individuals who there await its return. Meanwhile the water in the channel becomes gradually reduced in density due to the fact that, whereas at high tide the fresh water from the brooks flowed out over the surface of acres of salt water and therein lost itself, now the downstream current is concentrated in a narrow channel along which are scattered a few depressions, the permanent tide pools. These tide pools are also reservoirs of life during the low-tide intervals, and some come to have permanent residents such as tube-building worms, bivalves, snails and isopods. The importance of the tide pools as a resort of protection from reduced density is further demonstrated by the distribution of several forms which extend no farther upstream than the last tide pool on its course at station G. *Fundulus*, however, was observed to ascend beyond this point with the incoming tide but returned with the tide and remained in the pool during the low-water interval.

Among those forms which exhibit no pronounced reaction to density change, the isopods and amphipods inhabiting the channel where density extremes are greatest, appear as active at high water as they are at low water, and those forms inhabiting situations higher up on the beach pursue their normal activities although uncovered by the tide. Among the snails *L. littorea*, *L. rudis*, *L. palliata* and *N. obsolcta* seem unaffected by the change in their environment as far as feeding habits are concerned, for they seem to feed with very little inconvenience whether submerged or covered by the tide. These two classes of animals possess respiratory apparatus which permit a wide range of use. Isopods and amphipods provide their gills with a secretion of constant density. Snails immerse their foot in mud or are continually wet from the fuscus fronds, and this water in both instances has a higher specific gravity than that in the channels below. Another class, (*b*) animals whose habitat does not subject them to great extremes of density, include inhabitants of the deeper parts of the permanent tide pools and of those situations above the high-water mark, some of whose fauna, as the beach fleas (*Orchestiidae*) and the snail (*Melampus*), are terrestrial forms of recent brackish-water origin.

THE TEMPERATURE

During the cold seasons temperature imposes upon the brackish-water inhabitants of this stream a sentence with very few compromising limitations; they must either live in the mud, migrate, or die. Some of the animals live in the mud, and, being highly specialized for that type of existence, pass the year in the same abode. Many of the inhabitants migrate into more favorable waters, but this is a costly effort and many of them fail to reach suitable winter quarters. Winter overtakes the old, the weak and the cripples, and the

shells of dead molluscs and crustaceans are scattered over the bottom of the channels everywhere.

An important effect of the lower temperatures is the protection it affords immature forms especially of the edible clam *Mya arenaria*, the mussels *Modiola* and *Mytilus* and the muck clam *Macoma balthica*. The young of these bivalves do not have the fixed residence which they assume in late spring and retain during the remainder of their existence, and they would be exposed to carnivorous species if the latter were present during these early stages of their development. Great numbers of the young bivalves were found in the winter dredgings and shore collections of stations *A*, *B*, *C*, *D* and *F*.

It is only during the winter months that the fauna is unquestionably distributed with reference to the prevailing temperatures, and even then a scarcity of food materials may be as much responsible as any other factor. In the summer months temperature seems to have little importance in determining the distribution of species at any station since the temperatures are nearly the same at all stations. Winter conditions persist from November until March, and the area is covered with ice from the middle of December until the last of February. During this period low temperatures and storms impose practically an arctic habitat with a maximum ice thickness of 14 inches and an average thickness of 9 inches. This ice is formed everywhere except over the permanent tide pools which remain free except during intervals of extremely cold weather. Along the shores the ice-field fuses with the ground-ice, and a rise of the tide causes rifts to appear parallel with the shore. As the incoming tide wells up through the rifts in the ice, it freezes, pushing the ice shoreward with great force and tearing away huge blocks of turf which are later deposited at other points. Furthermore, during the low-water interval the ice-cover lies heavily over the mudflats obliterating surface-inhabiting forms and freezing out of existence dilatory refugees in the shallow tide pools. But before winter comes most of the mobile inhabitants of the area have migrated downstream and into deeper and more hospitable water.

SUCCESSION OF A BRACKISH-WATER STREAM

The most obvious succession occurring in a brackish-water stream environment is intertidal. The terrestrial condition of an exposed mud flat is succeeded by an aquatic environment with its load of food for the hungry together with a troupe of foraging fish and crabs. The tide pool of the low-water interval, with its group of imprisoned fish, molluscs and crustaceans, is obliterated when the tide comes in. These reservoirs of life spill their contents in all directions. The "assassin snail" *Urosalpinx cinereus* lumbers off in search of prey; the minnows and shrimps move upstream to the new shallows, and the "hermit crab" *Pagurus longicarpus*, together with his relatives the "green crabs" *Eurypanopeus depressus*, and *Carcinides maenas* scurry off over the submerged mud flats to see what mother nature has left on the

pantry shelf. Intertidal succession proceeds just as regularly in the other habitats of the brackish-water areas all summer long until winter comes. Then they migrate and rearrange themselves elsewhere until spring comes again. This seasonal succession is almost a cataclysm in the brackish-water habitats, for when several species desert their normal residence the remaining members of the association make extensive readjustments. The process of seasonal succession goes on even up in the salt-marsh area, and it is most noticeable in the spring and fall. Although the soil is the same the tides reach parts of the meadow where not only salt but fresh-water conditions prevail. In the spring the "blue-flags" and other aquatics advance a short distance displacing the salt-marsh grasses, and in the marsh channels and tide pools one may find fresh-water snails, tadpoles and insect nymphs and larvae in the same situations with the brackish-water amphipods and snails. But when the droughts of late summer and fall prevail, the salt marsh invades the meadow, aquatic forms of fresh-water origin disappear from the marsh channels, and brackish-water forms reach higher levels in the channel and on the marsh. Now this seasonal succession at the high-water mark on the marshes is prophetic of final physiographic and biological succession, for as the fresh-water channel is worn deeper, and drainage is perfected, the spring advance of the upland forms is lessened until the salt marsh dominates to the high-tide mark.

Downstream, where tide currents carve and build the channel banks, physiographic succession is more obvious. For instance, the channel of station *D* was shifted in an easterly direction a minimum of 115 feet and a maximum of 270 feet during the ten-year interval. This meant more than a shifting of the animal inhabitants from one side of the channel to the other. During the process the mud flats were built higher, inducing the accumulation of muck and retarding the disintegration of the blocks of turf left there by stranded ice cakes. This condition has invited a growth of the marsh sedge, *Spartina*, known everywhere along shore as "thatch-grass" which, by means of a thickly interlacing root system succeeds in maintaining itself on the surface of muck. Ultimately it consolidates the material, and, catching additional mud, builds up the area high enough to afford a foothold for the marsh grasses which follow behind the advancing *Spartina* sedge. The succession, then, is in the order of: eroding channel, depositing shore, mud flat, muck, *Spartina* sedge and salt marsh. This is precisely what is happening at station *D* where several irregular islands of the *Spartina* sedge have developed during the interval 1914-1924. In general, then, the salt-marsh habitat is a condition of senescence, and the eroding fresh-water brook is the youngest stage of the series. Between these two it would appear that physiographic succession on Bunker's Creek has proceeded in the order described above. As a glacial stream, Bunker's Creek eroded a basin larger than it is now able to keep clear. Subsequently it was invaded by water of marine origin, and an era of sedimentation was inaugurated when a reduction occurred in its

supply of fresh water. Long ago it began to choke up, and before another cycle of erosion is inaugurated the present tendency indicates that Bunker's Creek will continue to fill. The belt of border-marsh is creeping out over the flats, station *H* the salt-marsh meadow, is moving downstream, the mud flats are contracting to a strip along the channel, the tide-passages of stations *B* and *E* are washed by a lessened quantity of water, the tide pools are contracting and Bunker's Creek as an excellent field collecting station is passing.

SUMMARY

1. This is an ecological study of Bunker's Creek, a brackish-water tributary of Oyster River in Durham, New Hampshire.

2. Very great fluctuation occurs in the density of the waters of a creek fed from a fresh-water brook and periodically influenced by tidal waters of marine origin. Maximum densities are registered at the height of the flood tide and the lowest densities occur at the end of the low-tide interval. The density range is greatest in the tide pools located nearest the high-tide mark. During the low-tide interval the water of a permanent tide pool is stratified into a surface layer of comparatively fresh water, an intermediate stratum of diffusion and a body suffering gradual density reduction. Fluctuation of the density in the brackish-water habitats plays an important part as a selective agency in the distribution of their inhabitants. The latter habitually avoid extreme reduction of the density. This is accomplished either by retaining salt water in the gill chamber or by retreating into deeper waters when the tide goes out. The tide pools then become reservoirs of life and are so important that no brackish-water area could support actively mobile animals without a tide pool as a part of its physiographic equipment.

3. Although intertidal temperature ranges are considerable they are rather evenly distributed throughout the brackish-water habitats, and hence are not powerful selective agencies in the distribution of the inhabitants. The seasonal range of temperature, however, is a highly important factor influencing the seasonal distribution of the entire fauna. The formation of ice forces some forms to migrate while others hibernate until more favorable conditions prevail. This presents an opportunity to some animals to develop through immature stages without being harrassed by natural enemies. All of the inhabitants of Bunker's Creek are adapted for making readjustments when winter comes.

4. A qualitative study of the communities along this stream indicates a natural grouping of the animals into associations occupying the following habitats: channel tide-pool, bottom debris, mud-flats, muck-flats, lower sand belt, shore-stones, fucus-ascophylum and border marsh.

5. Studies undertaken at eight points along the course of the stream indicate gradual numerical reduction of the inhabitants as one ascends the stream, both qualitatively and quantitatively.

6. Intertidal, seasonal and physiographic succession occurs as constant phenomena. During a ten-year period physiographic succession at several points has been sufficiently pronounced to indicate that on Bunker's Creek the salt-marsh meadow is a senescent condition of a series in which the order of development has been: eroding channel, depositing-shore, mud-flat, muck, *Spartina* sedge-muck, *Spartina* sedge-peat, and salt-marsh.

Distribution of the inhabitants of Bunker's Creek

Organisms	Associations							Stations							
	Shore-stones	Fucus-Ascophyllum	Sand	Mud-flat	Muck-flat	Tide-pool-Channel	Bottom-debris	A	B	C	D	E	F	G	H
	<i>Cliona sulphurea</i>							S	A	A	A		L		
<i>Sertularia pumila</i>		S					S	A	R						
<i>Clava leptostyla</i>							S	L	L			R			
<i>Obelia</i> sp.?.....		S					S		L						
<i>Eudendrium</i> sp.?.....		S					S		L						
<i>Membranipora</i> sp.?.....								R	L						
<i>Enchytraeus albidus</i>	S							R	L	R	A	A	L	L	R
<i>Lumbricillus agilis</i>	F							L							
<i>Nereis virens</i>	S		P	P	P		P	L	R	A	A	L	L	L	R
<i>Spio</i> sp.?.....							P		L						
<i>Lepraea rubra</i>							P		L						
<i>Ampharete setosa</i>			P	P	P		P			L	L	A			L
<i>Nolomastus filiformis</i>			P	P	P		W	L	R	L	A		A		L
<i>Nolomastus luridus</i>			P	P	P		P		R						
<i>Scolecolepis viridis</i>			P	P	P			L	A	L	R				
<i>Clymenella torquata</i>			P	P		P	P	L	A	L	R				
<i>Ostrea virginica</i>					S		P	L	A	L	L		A		
<i>Mytilus edulis</i>	P	P					P	L	A	A	L		A		
<i>M. edulis</i> var. <i>pellucidus</i>	P						P	L	A	A	L		A		
<i>Modiolus dem.</i> var. <i>plicatulus</i>	P	P			P		P	L	L	L	L	A	L	L	L
<i>Gemma gemma</i>												L	L	A	
<i>Macoma balthica</i>			P	P	P			L	L	L	A	A	L	A	TW
<i>Mya arenaria</i>	P									L	L	L	L	R	R
<i>Melampus lineatus</i>					S					L	L	L	L	L	A
<i>Ilyanassa obsoleta</i>		TS	TS	S		W	TSW	L	R	L	A	L	L	R	R
<i>Urosalpinx cinereus</i>							S	L	L						
<i>Odostomia bisuturalis</i>	P							L	A	A	A	L		L	
<i>Littorina rudis</i>	P	P	TS	TS	TS			L	A	L			L		
<i>L. rudis</i> var. <i>tenebrosa</i>	P	P						L	A	R	L		L		R
<i>L. rudis</i> var. <i>black</i>	S						S	L	A	L		L	L		R
<i>L. rudis</i> var. <i>grey</i>	P	P			TS			L		A	L		L		R

Organisms	Associations							Stations							
	Shore-stones	Fucus-Ascophyllum	Sand	Mud-flat	Muck-flat	Tide-pool-Channel	Bottom-debris	A	B	C	D	E	F	G	H
	<i>L. rudis</i> var. banded.....	S								L	L				
<i>Littorina palliata</i>		P						A	R	A		L			
<i>Littorina litorea</i>	S	P	TS		TS	W	W	A		A	L	L	R		
<i>Paludestrina minuta</i>	P							A		A					
<i>Planorbis bicarinatus</i>							TS								R
<i>Segmentina armigera</i>							TS								R
<i>Balanus improvisus</i>	P						SW	A	A	R		R			
<i>Michtemysis stenolepis</i>						W	P	R	R	R	L	A			
<i>Asellus communis</i>	TS	P	P	TS		TS		R	R	R	L	A		R	
<i>Cyathura carinata</i>				TS				L	R	R	L			L	
<i>Edotia triloba</i>				S	S			R			L		L		
<i>Porcellio rathkii</i>															R
<i>Caprella geometrica</i>		S						R	R	R					
<i>Carinogammarus mucronatus</i>	S	S	TS		TS		S	L		L					
<i>Gammarus annulatus</i>	SS	PP	TS		TS		S	L	A	L					
<i>Gammarus locusta</i>	SS	PP			TS		S	A	A	A		A			
<i>Orchestia agilis</i>	SS	PP						A	A	A					
<i>Orchestia grillus</i>	S	P						A							
<i>Orchestia platensis</i>															A
<i>Jassa marmorata</i>		S				S	S	R	R	R					
<i>Melita nitida</i>		S	S	TS		S	S	R	R	R	L				
<i>Hyalella asteca</i>	S	S						R	R	R	R	A	A	A	
<i>Palaemonetes vulgaris</i>						S	S	R	R	R	A	A	A	A	
<i>Eurypanopeus depressus</i>	S	S	TS	TS		W	S	A	A	A		A	R		
<i>Neopanope texana</i>	SS	SS					S	A	A	A					
<i>Carcinides maenas</i>	S	S				W	TS	A	A	A		R			
<i>Cancer irroratus</i>		S					S								
<i>Crago septemspinosa</i>						S	S				A	A	L	R	
<i>Pagurus longicarpus</i>						S	S				A	R	L		
<i>Limulus polyphemus</i>				TS	TS	TS		R		A	L	L	L	R	

KEY:

P—found throughout the year.

S—taken only during the summer.

W—winter habitat.

T—transient form.

A—abundant.

L—limited number found at any time.

R—rarely found.

Determinations were obligingly made as follows: the worms, Dr. J. Percy Moore of the Philadelphia Academy of Natural Sciences; the molluscs, Dr. C. W. Johnson of the Boston Society of Natural History; the crustacea, Dr. Paul Bartsch of the U. S. National Museum.



THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION



WILLIAM CASS, P.E.
ASSISTANT COMMISSIONER

June 10, 2015

Durham
X-A000(202)
16236
[US Rte. 4/ Bunker Creek Bridge Replacement]

Bureau of Highway Design
Room 200
Tel: (603) 271-2171
Fax: (603) 271-7025

Harriet Forkey
104 Piscataqua Road
Durham, NH 03824

Dear Ms. Forkey:

On behalf of William Cass, Assistant Commissioner, I would like to acknowledge your letter of June 3, 2015 in reference to the Department's proposal for the replacement of the US Rt. 4 Bunker Creek Bridge in the Town of Durham.

Your request for consideration of noise abatement, narrower bridge span and support for short-term road closure will be included in the official transcript of the Public Hearing, and will receive the consideration of the Hearing Commission.

Sincerely,

Keith A. Cota, P.E.
Project Manager

KAC/kac

cc: William Cass, Assistant Commissioner
Chuck Schmidt, Administrator, Bureau of Right of Way
John Butler, Preliminary Design, Bureau of Highway Design
Commission Members
Chairperson Dale Sprague
George Rief
Thomas Richardson

Harriet Forkey
104 Piscataqua Road
Durham, NH 03824

June 3, 2015

William Cass 
Director of Project Development
NHDT
PO Box 483
Concord, NH 033302-0483

RECEIVED
COMMISSIONERS OFFICE

JUN 08 2015

THE STATE OF NEW HAMPSHIRE
DEPT. OF TRANSPORTATION

Dear Mr. Cass,

I spoke briefly at the hearing on May 28th regarding the Bunker Creek Bridge and would like to expand on that testimony. I own and reside in a home located at 104 Piscataqua Road that is the closest house on the west side of the Bunker Creek Bridge. I have personally resided at this home for 31 years, and it has been owned by my husband, Jere Lundholm or his family since it was built in 1937.

The following comments and concerns are:

Noise abatement and Safety: The noise from the cars and trucks is unabated as it travels across the water. If we are out in the yard, on the dock or in the house it is very noticeable and intrusive. Just opening one window can allow the noise to interfere with normal communication. Any solution you can come up with to abate this problem would be greatly appreciated. Some ideas worth exploring are using concrete traffic guards similar to what is used on Scammel Bridge; keeping the bridge profile low and not raising it the suggested three feet but keeping it at its current height. This would mean

that changing the pitch of the road would occur mostly by taking off the top of the knoll to the east. This might also diminish the amount of Jake Brakes that are used coming off the existing knoll. Also, lowering the speed limit to 40mph as recommended in a DOT funded safety study several years ago would lower the noise and also be safer for those turning into their homes, housing developments and especially Wagon Hill Farm and Emery Farm which have a lot of entering and existing traffic all day long. We have over 16,000, cars and trucks using this road daily. The future trend is for increased growth in the seacoast region. This will create even larger numbers using this road and the Bunker Creek Bridge.

Bridge size and location: The current bridge is 15 feet long and the proposed bridge is 60 feet. The proposed span of 60 feet will seriously impact the health of the fragile marsh grass and creek. Staying as close as possible to the existing length of the bridge will be much more environmentally friendly. We have seen serious erosion and loss of eelgrass over the years. This is a very sensitive area and needs tender love and care that translates to little disturbance to the creek. Further study that considers moving the road further to the north on the east side of the bridge may help reduce right of way issues without endangering the marsh and creek. The addition of five-foot bicycle/walking lanes is a very welcome safety addition to this road.

Closing the existing bridge vs. installing a temporary bridge: Closing the existing bridge and using the ABC (accelerated bridge construction) process can be accomplished within the parameter of two weeks according to the DOT testimony at the hearing. The complete time needed is estimated at three months with a cost of three million dollars. Installing a temporary bridge would take at least 18 months at

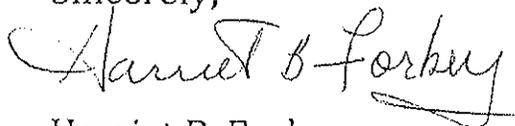
a cost of four million dollars. No one spoke about the inevitable traffic delays created by just trying to build a temporary bridge with all the added trucks and construction vehicles creating traffic issues. I assume that over this eighteen-month period these could be very problematic. No one spoke or asked about the removal of this temporary bridge as to cost and ecological damage!

The only people who spoke in favor of a temporary bridge were some of the "first responders" (EMT's & Fire). Their concern focused on possible added time to reach hospitals because of the need to be detoured onto alternate routes while the 2 week ABC bridge was being installed. I strongly believe that an eighteen month time for construction with a temporary bridge will create many more potential delays and therefore added time to get to destinations than a three month time for construction with only two weeks of actual time with the bridge closed and viable alternate routes available!!!

I can only conclude that the most rational way to proceed whether it be for safety, cost or environmental effect is to use the ABC approach and provide additional noise abatement solutions, minimize right of way issues, and have safety and environmental integrity as top priorities

Thank you for seriously considering my additional testimony.

Sincerely,



Harriet B. Forkey

Lundy-nh@comcast.net

(603) 868.2283



THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION



WILLIAM CASS, P.E.
ASSISTANT COMMISSIONER

June 10, 2015

Durham
X-A000(202)
16236
[US Rte. 4/ Bunker Creek Bridge Replacement]

Bureau of Highway Design
Room 200
Tel: (603) 271-2171
Fax: (603) 271-7025

Alfred Ackerman
Nancy Schieb
13 Morgan Way
Durham, NH 03824

Dear Mr. Ackerman & Ms. Schieb:

On behalf of William Cass, Assistant Commissioner, I would like to acknowledge your letter of June 5, 2015 in reference to the Department's proposal for the replacement of the US Rt. 4 Bunker Creek Bridge in the Town of Durham.

Your support for short-term road closure and consideration for posted speed reduction will be included in the official transcript of the Public Hearing, and will receive the consideration of the Hearing Commission.

Sincerely,

Keith A. Cota, P.E.
Project Manager

KAC/kac

cc: William Cass, Assistant Commissioner
Chuck Schmidt, Administrator, Bureau of Right of Way
John Butler, Preliminary Design, Bureau of Highway Design
Commission Members
Chairperson Dale Sprague
George Rief
Thomas Richardson

Re: Durham K-1001 (2002) #16236

5 June 2015

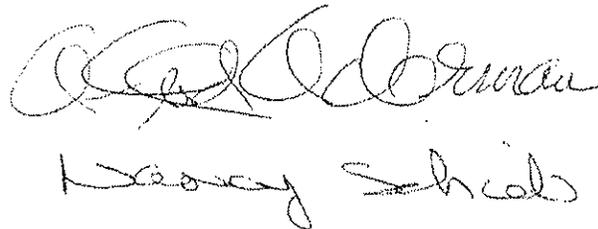
To Whom It May Concerns:

As residents of Morgan Way, Durham, we are interested in the proposed bridge construction over Bunker Creek. We would like to reiterate what every resident brought up at the meeting last Thursday, that the diversion is not a good idea. As residents who will be greatly affected by the closure, we would rather suffer a short inconvenience than have a protracted construction project that impacts property and the delicate environment of the Great Bay.

Secondly, and most importantly, we would ask the commission to revisit the Traffic Safety Study of 2000 that was mentioned by a resident at the meeting. If lowering the speed limit to 40 mph along the section proposed in the study would positively impact the bridge construction, we feel strongly that this should be pursued. Another important consideration in lowering the speed limit would be the safety of the residents who live on or just off Rt 4. As we have experienced, turning into Morgan Way east bound can be a harrowing experience. The majority of the traffic is exceeding 45mph and sitting out in the turn lane with speeding traffic coming at you in both directions can feel life threatening, especially with the ever increasing semi-trucks. If we are going to make Rt 4 more bike friendly by widening the bridge, why not lower the speed limit, making it a safer street as well. It will also reduce the sound which has become increasingly greater as the traffic and consequently the unregulated, increased speed.

In conclusion we would respectfully ask the commission to strongly consider the short term closure and reconsider the recommendations of the 2000 Traffic Safety Study when making the final plan for the Bunker Creek Bridge work. This would ultimately create a more user friendly and safer road as well as greatly improve the quality of life for the residents who live along it.

Alfred Ackerman
Nancy Schieb
13 Morgan Way
Durham, NH 03824
603.397.5738



Alfred Ackerman
Nancy Schieb

A.S.

I have been out of town on a family emergency, missing the meeting, and hope this gets you in 10 business days.

Alfred Ackerman

RECEIVED
COMMISSIONERS OFFICE

JUN 09 2015

THE STATE OF NEW HAMPSHIRE
DEPT. OF TRANSPORTATION