In accordance with provisions of the Americans with Disabilities Act (ADA) of 1990, the CCRPC will ensure public meeting sites are accessible to all people. Requests for free interpretive or translation services, assistive devices, or other requested accommodations, should be made to Bryan Davis, CCRPC Title VI Coordinator, at 802-846-4490 ext. *17 or bdavis@ccrpcvt.org, no later than 3 business days prior to the meeting for which services are requested.
Project list:

- Title VI program participation and Public Participation Plan implementation
- Participation in the Vermont Highway Safety Alliance
- Participation in the State’s Rail Council
- Regional Transportation Model Update
- Metropolitan Transportation Plan (MTP) Update
- Coordination with United Way on the Neighbor Rides Program
- Exit 14 Areas Signal System Assessment Study (Burlington/South Burlington)
- VT Route 15 Signal System Assessment Study
- Advanced Traffic Monitoring System through FHWA AID grant – Pilot Corridor Implementation
- Countywide NHS Review and Update
- LPM services for Underhill sidewalk construction on VT 15 – Construction postponed
- LPM services for Shelburne sidewalk construction on US 7 – Final Complete, punch list items pending
- LPM services for South Burlington sidewalk construction on VT 116 – Construction Completed pending minor backfill and pavement markings
- LPM services for Hinesburg – Village South Area Sidewalk on VT 116 – Conceptual Design
- Winooski Avenue Corridor Study (Burlington)
- Amtrak Train Overnight Storage Study (Greater Burlington Area)
- Coordination with GMT on ADA and Elders & Disabled advisory committees
- Railyard Enterprise Supplemental Scoping of Alternative 1B (Burlington)
- Winooski River Bridge Scoping Study (Burlington/Winooski)
- South Burlington Bike Ped Gaps scoping
- Intervale Ave. Scoping (Burlington)
- Colchester Ave/Riverside Ave/Barrett St Intersection Scoping (Burlington)
- US 7 Southern Gateway Scoping (Shelburne)
- North Williston Road Scoping Study (Williston)
- Traffic calming studies for Blair Park Road, Brennon Woods/Chamberlain Lane (Williston)
- So. Burlington Williston Road Area Transportation and Land Use Network Analysis
- So. Burlington VT116-Kimball-Tilley Land Use and Transportation Plan
- Williston Exit 12 Transportation Improvement District (TID) Pilot Project
- Jericho Riverside Future Street Network Study
- I-89 Exit 14 Bike/Pedestrian Crossing Study (South Burlington)
- Essex Path/Sidewalk Impact Policies
- Shelburne Phase 2 of Form Based Zoning to Improve Walkability
- Overhaul of South Burlington’s Traffic Overlay District
- Update to South Burlington’s Transportation Impact Fee Ordinance
- ADA Evaluation of Pedestrian Facilities (Essex/Essex Junction)
- Malletts Bay Stormwater and Transportation Management Plan (Colchester)
- Regional Transportation Energy Planning
- Transportation Hazard Mitigation Planning
- Municipal Road General Permit (MRGP) Work
- Grants-In-Aid Coordination with Municipalities.
Peter Keating called the meeting to order at 9:00AM and asked for a round of introductions.

1. **Consent Agenda**
   No items this month.

2. **Approval of Minutes**
   The July 5th minutes were approved without changes.

3. **Public Comments**
   There were none.

4. **GMT’s NextGEN Transit Plan**
   Dave Armstrong of GMT described this planning work now underway with the help of consultant Nelson Nygaard. The Plan is designed to improve service throughout the system. The plan will help identify ways to:
   - better match service with current needs,
   - make service simpler, more direct, faster, and more convenient, and
   - better integrate urban and rural services.
   Dave described this plan as one recommending changes between now and the next five years. He noted that much of the Plan will be based on decisions around trade-offs. For instance, those between levels of coverage, frequency, days of service, transfers, route directness and bus stop spacing. So far, there’s been work on all of the existing routes and some preliminary recommendations. Route profiles document route statistics, note route variants and suggest possible modifications. GMT and consultant staff have also done a market study to determine transit demand that includes:
   - Population and employment density
   - Socio-economic characteristics
   - Major activity centers, and
   - Work trip travel flows
That analysis revealed that GMT routes cover the areas of highest demand fairly well. Dave described the public outreach process that included a live blog, Survey Monkey, RPCs, local events, and public hearings. Based on the analysis and input the Plan has recommended a draft service scenario which includes:

- Simplified service(s): Fewer route deviations with more linear service
- Bolstered network of “Major Local Routes:” #7 North Ave, #2 Essex Jct., #1 Williston Rd, #6 Shelburne Rd
- More evening service
- More/better weekend service
- Minimum service frequency-standards: e.g. Major Local route – trip every 20 minutes, Local route (#5 Pine St) trip every 30 minutes
- One-seat connection to Airport

Next steps in Plan development are:

- Continue to hold monthly Advisory Committee meetings
- Continued “public” involvement: RPCs, Towns/Cities, Planners, Passengers, Non-passengers
- Finalize service recommendations for display/discussion
- GMT Board approval
- Implementation
- Fare policy study

The expectation is that the Plan should be complete at the end of the calendar year.

5. MTP Update

Peter referred members to the memo on this in the meeting packet. There were three items to present.

First was the MTP development schedule and what the TAC would be scheduled to review at upcoming meetings through March 2018. This was highlighted in a table in the memo. Next Peter addressed the financial plan of the MTP. There are three elements to this:

1. Identify the funding “reasonably expected to be available”
2. Determine the level of funding needed to operate and maintain the existing system
3. Calculate the difference between 1 and 2 and determine how this will be allocated to new projects/strategies

Element #1 was determined by looking at the history of federal funding coming to the entire state and then calculating what a reasonable share of that total would come to Chittenden County. This concluded that the CCRPC regions would get, on average, 19.4% of the state total which comes to $41.05M per year (in 2016 dollars). Peter noted that VTrans has agreed on the reasonableness of this methodology. For element #2, we developed average annual costs based on historic TIP obligations to:

- Paving and Bridge, and
- CCTA Maintenance and Operations

We used these as proxies for the operations and maintenance calculations. When we looked at the overall funding proportions that went into these categories over different time periods we saw very different results. If we take the long view back to FY2000 up to FY16, the maintenance and operations share is 55%. If, however, we look at a shorter period, over the past seven years, that share is over 73%. After consultations with VTrans we’ve decided to go with a higher percentage for our planning purposes. Next steps will be include establishing funding levels to project categories using the calculated balance between elements #1 and 2 above.

The third part of the MTP update had Jason go over some transportation model results. He began with a series of charts showing region-wide results from 2015 and 2050 with and without TIP projects. Measures charted included VMT, VMT per capita, VHT, delay per capita, transit/walking/biking mode split and average trip length. Many of the measures see significant changes due to the projected increases in houses and jobs expected over the 35-year planning period. He also showed maps of 2015 and 2050
featuring two measures of congestion: Volume to capacity ratio and delay per mile. Jason noted that these were just some of many other measures the model will produce and that we intend to analyze in the coming weeks.

6. Municipal General Roads Permit (MGRP) Update
Jim Ryan of ANR attended to provide the latest information on this. He reported that a final draft will be out this week and that there will be a 45-day comment period following the MGRP release. He began his presentation with some background that included the legislative language guiding the permit and the near and long-term timeline for key permit deliverables. He next defined what’s covered by the permit and what a hydrologically connected road is. He then went into some detail on the permit’s major components: Inventories, prioritization and implementation. Jim defined the following as MGRP principles:

- First- disconnect road Stormwater whenever possible, starting at the top of the road watershed
- Second- Infiltrate stormwater
- Third- Stabilize conveyances and turn out ditches

This was followed with a description of baseline standards then the following summary for towns:

- Application coverage and annual fees to begin in July 31, 2018
- Road erosion inventories for hydrologically-connected roads due for all towns by 12/1/2020 and updated every 5 years thereafter.
- Implementation plans and schedules by 12/1/2020
- Road BMP implementation on or before 2021 to achieve all connected roads meeting standards by 2036 (a minimum amount of implementation per year)
- Annual reporting on implementation progress due every February starting 2/1/2019

He finished mentioning assistance to towns from funding (new municipal grant-in-aid), outreach and technical assistance, and shared equipment.

7. Status of Projects and Subcommittee Reports
Peter referred members to the project list on the back of the agenda and encouraged members to inquire on project status if interested.

8. CCRPC July Board Meeting Report
Peter mentioned that the Board held the public hearing and adopted the FY18 TIP.

9. Chairman’s/Members’ Items
No items this month

The meeting adjourned at 11:00 a.m.

Respectfully submitted, Peter Keating
CCRPC Transportation Advisory Committee  
CCRPC Clean Water Advisory Committee  
October 3, 2017

Agenda Item 4.

**CCRPC comments on draft Municipal Roads General Permit**  (Action Item)

**Background:**  
On Monday, September 11th, Vermont DEC formally issued its draft MRGP. See info at: [http://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/municipal-roads-program](http://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/municipal-roads-program). The public is invited to provide written comment on the draft MRGP through the close of business (4:30pm) on October 27, 2017. Written comments on the draft MRGP should be emailed to Jim Ryan at jim.ryan@vermont.gov or mailed to: Jim Ryan DEC Stormwater Program 1 National Life Drive, Main 2 Montpelier, VT 05620-3522

CCRPC staff as well as Jim Ryan of DEC have provided prior presentations to both the TAC and the CWAC.

Attached are draft formal comments prepared by staff along with a short memo showing how are previous comments from March were addressed. A separate PDF collates the draft Permit along with referenced attachments.

**Action:**  
The TAC and CWAC should review and provide any desired edits to the draft comment letter. Staff will compile and incorporate these comments and then ask the CCRPC Board to finalize the letter and its formal transmittal to Jim Ryan at its October 18th meeting.

**Staff contact:**  
Dan Albrecht, [dalbrecht@ccrpcvt.org](mailto:dalbrecht@ccrpcvt.org), 861-0133

Chris Dubin, [cdubin@ccrpcvt.org](mailto:cdubin@ccrpcvt.org) 861-0121
Thank you for the opportunity to comment on the draft Municipal Roads General Permit. Please consider these comments of our Board of Directors approved at their monthly meeting on October 18th.

**General comment** – The MRGP references numerous documents/forms which are to be used by municipalities to work towards and/or demonstrate compliance with this permit including, for example:
- DEC Road Erosion Inventory Template
- MRGP Implementation Table
- RSWMP Implementation Table
- Implementation Table
- MRGP Planning Report
- Culvert sizing based on in-field and mapping techniques
- Catch Basin Inventory and Outlet Erosion Evaluation

The draft permit directs the reader to obtain these various documents by accessing them on the recommended web links. However, in some cases, the referenced documents are embedded within larger PDFs or within additional links whose names are not intuitive to the casual user.

**Recommendation 1** CCRPC recommends that DEC create a separate webpage or Permit Appendix which clearly lists and numbers each of the various documents (e.g. MRGP, Attachment A-DEC Road Erosion Inventory Template; Attachment B-Example RSWMP Implementation Table, etc) that are to be used to comply with this MRGP as well as provide examples where appropriate.

**Specific comments:**

**2.1 Duty to Apply**

**Recommendation 2** There is a reference to MS4 and “Part 7” in the 3rd sentence. It appears that this should refer to “Part 6.”

**3.1. Submittal of Initial Notice of Intent and Application Fee**

**Recommendation 3** A $2,000 flat annual fee is too heavy of a burden for smaller towns. The total amount of fees should be tied to the cost to administer the permit and not generate excess
revenue. Fees could be a lower flat fee, be tiered, or be variable depending on the number of connected road segments or road-related impervious cover. There should be some incentive, such as a reduced fee, for towns to complete their road erosion projects in less than the 20-year timeframe.

4.1 Comprehensive Plan for All Stormwater Discharges

A.1 Road Erosion Inventory for all municipal hydrologically-connected road segments

Slope Data – Because required BMPs vary for different slope ranges, 0<5, 5<8, 8+, 10+ the use of accurate slope data is critical. As Chittenden County has recent 2014, 1ft. contour LIDAR data, the CCRPC with DEC concurrence, has used this data (rather than that in the ANR Atlas) to derive slope values in order to perform road erosion inventories in 2016 and 2017.

Recommendation 4 CCRPC recommends that the permit should clearly allow the use of alternative data sources when more accurate data exists.

a. “For paved roads with catch basins: the catch basin outfall pipe is within 500 feet of a water of the state or wetland.”

Within 500 feet seems overly expansive and inconsistent with use of 100 ft. as a cutoff point as noted in 4.1.A.1.b.1 and with use of “uphill” as noted in 4.1.A.1.b.3.

Recommendation 5 CCRPC recommends modifying to reduce distance to “within 100 feet and uphill of a water of the state or wetland.”

The REI will include a road erosion “score” for each hydrologically-connected road segment. All road segments will be scored as “Fully Meets,” “Partially Meets,” or “Does Not Meet” the standards listed in Part 6 of this permit. A detailed procedure for scoring road segments is provided in the Inventory. Road segments that score “Partially Meets” or “Does Not Meet” shall be upgraded to meet standards according to the municipality’s implementation schedule. Road segments that score “Fully Meets” do not require upgrades, but shall be maintained to ensure that they continue to meet standards. The Inventory scores and explanation of those scores shall be entered into the RSWMP Implementation Table.

We appreciate the inclusive process by which DEC developed the Road Erosion Inventory methodology especially the involvement of CCRPC and other Regional Planning Commissions. Overall, the Inventory Template is useful to assessing the various attributes of a given road segment with regards to its ability to handle stormwater. However, we have the following recommendations which, if followed, would more appropriately target remedial actions/upgrades to improve water quality.

The inventory assesses the degree to which various standards ----Crown, Berm/Windrow, Drainage, Conveyances/Turnouts, Driveway Culverts, Drainage Culvert and Rill/Gully Erosion--- are being implemented on a given segment. Depending upon how many of these standards are considered to
have scored as Partially Meets or Does Not Meet determines the Overall Segment Score. We are concerned however that all these Standards are weighted equally regardless of their relative impacts to water quality.

In July 2017, the firm of Fitzgerald Environmental completed development of a refined and field-calibrated Road Erosion Prioritization Methodology (see attached memo dated July 14, 2017) based upon 2016 inventory data collected by CCRPC. Most critically, the methodology weights the relative importance of these standards vis-à-vis sediment and pollutant source and transport mechanisms. The methodology concludes that the most critical variables and those that should be weighted the highest when predicting impacts to water quality are:

- Slope
- Adequacy of Road Drainage
- Total Number of Poor Conveyances
- Gully Erosion Locations
- Stream and Road Conflicts
- Total Conveyances
- Stream Culverts

Conversely, the performance of the following variables was less critical:

- Roadway Crown
- Berm
- Total Road Drainage Culverts less than 18” in Diameter
- Total Road Drainage Culverts lacking Header(s)
- Total Driveway Culverts less than 15” in Diameter

Therefore, we recommended that the REI Scoring Methodology be refined to incorporate this analysis so that the RSWMP Implementation is focused on improving water quality rather than focusing on meeting road maintenance and construction standards. Therefore, we recommend:

**Recommendation 6** Adjust any or all of the following standards from the Segment Scoring process [Roadway Crown, Berm, Road Drainage Culverts less than 18” in Diameter; Road Drainage Culverts lacking Header(s) and Driveway Culverts less than 15” in Diameter] so that they are not weighted equally with more “water-quality-determinant” standards. For example, scores of Partially Meets for these standards should not count as much towards the cumulative total [“One or two Partially Meets individual scores = Partially Meets segments score.”] that labels a segment as Partially Meets.

**Recommendation 7** Create one set of Partially Meets / Does Not Meet criteria for segments with slopes less than 5% and one for segments of 5% or more as Slope is probably the single most important variable.

**Recommendation 8** Require segments that Do Not Meet criteria for Adequacy of Road Drainage; a high number of Poor Conveyances; Gully Erosion Locations and Stream and Road Conflicts to be addressed in the first five years of the Permit to meet all standards.
Recommendation 9  Similarly, as Stream Crossings provide the most likely avenue by which sediment and flow can be conveyed into waters, require any segments with such crossings to be addressed in the first five years of the Permit to meet all standards.

Part 6. Road Stormwater Management Standards

This section is the heart of the permit. We appreciate the work that DEC has put into it. We have a few suggestions for improvement.

6.2 Required Standards for Gravel and Paved Roads with Ditches

Recommendation 10  With regards to “new construction” and “significant road upgrades,” please clarify that the MRGP standards only apply to such work if the segment is a hydrologically-connected gravel and/or paved municipal road segment with drainage ditches.

6.2 B. Road Drainage Standards

2. For roads with slopes 5% or greater but less than 8%:
   a. ......
   b. ......
   c. Grass-lined ditch if installed with disconnection practices such as cross culverts and/or turnouts to reduce road stormwater runoff volume. There shall be at least two cross culverts or turnouts per segment disconnecting road stormwater out of the road drainage network into vegetated areas, or spaced every 164’.

Recommendation 11  Please clarify item “c” above. Topography and field conditions may preclude spacing these cross-culverts/turnouts apart. Suggest revising to state “It is recommended that these be spaced at least 163’ apart.

4. If appropriate, bioretention areas, level spreaders, armored shoulders, and sub-surface drainage practices may be substituted for the Above Road Drainage Standards.

In more sparsely populated areas or areas of high elevation, existing municipal roads often lack ditches. Municipalities have had to prioritize the use of limited funds and grants and therefore focus most effort on more heavily traveled roads. To address the lack of ditches, road foremen often make several “grader cuts” along the edge of a road so as to act as a “conveyance” to direct water into adjacent vegetated areas or woods.

Recommendation 12  Please clarify under what conditions existing or new “grader cut” conveyances may be used.

Section 6.2.C Stable Conveyances – Drainage Outlets to Waters & Turnouts
Recommendation 13  CCRPC recommends that the permit make clear that in addressing outfalls, the Road Erosion Inventory is only required to address what is visible within the ROW, within any applicable easements or within the area allowed to be inventoried by the applicable property owner. The permit should make it clear that municipalities are not required to bring up to standards any outfall that is outside of the municipal ROW, outside of any applicable easement and not allowed by any applicable landowner.

6.3 Standards if Rill or Gully Erosion is Present on Gravel and Paved Roads with Ditches

This section is highly detailed. We appreciate the clear direction given. We have a few comments as follows.

Recommendation 14  The permit should make clear that these standards do not apply to new construction on non-hydrologically-connected segments?

Both rill erosion and gully erosion are defined with regards to depth as 1”-12” and 12” or more respectively. However, no difference is made in recommended standards depending upon the length or severity regardless of the fact that gully erosion of 5 ft. in length is a much more significant issue than rill erosion of 5 ft.

Recommendation 15  CCRPC recommends that the DEC establish a length measurement within the definition for both rill erosion and gully erosion, and establish standards appropriate for the length and severity of each issue.

Rill or gully erosion is mostly caused by inadequate road crowns, the presence of berms, slope and other factors. However, adherence to these standards mostly trigger improvements that are totally unrelated to said problem of rill or gully erosion. Furthermore, those discrete areas of improvement may not have any erosion issues at all.

Recommendation 16  CCRPC recommends improvements to road crowns, grading and/or berm removal in this section rather than improvements to culverts; or please explain the rationale for this section as written.

6.4 Standards for Connected Class 4 Roads

Currently municipalities are not required to maintain Class 4 roads in accordance with 19 V.S.A. § 310 and case law. We are, however, supportive of doing road erosion inventories of Class 4 roads. Additionally, we are also concerned that requiring maintenance on Class 4 roads, even if it is confined to major erosion problems, could lead to causing more erosion just to get to the site with the right equipment.

Recommendation 17  No permit requirements on municipalities should be established on Class 4 roads unless and until statute is clarified to specifically require this responsibility.

Putting legal issues aside, language in the draft permit and Inventory Template is problematic in that the presence of any gully erosion automatically classifies that Class IV segment as “Does Not Meet
Standard.”

Recommendation 18  CCRPC recommends that this standard be changed to say, for example, “any gully erosion equals Partially Meets, gully erosion exceeding 10 ft. in length equals Does Not Meet.”

Recommendation 19  CCRPC recommends it be made clear that improvements to Class IV roads to meet the MRGP standards shall be considered the last priority.

Part 10: Definitions

Recommendation 20  Please define “new road construction” and “significant road upgrades.” Clear metrics such as total linear feet, depth of reconstruction, etc. should be used and examples given. Additionally, it may be helpful to define what does NOT constitute either of these two key terms as they are used as triggers throughout the permit.

Recommendation 21  Please define “redevelopment” as used in Section 6.2, A.1.b.

Recommendation 22  Please clearly define and/or reduce the number of terms for “ditch,” “swale” and “gully”

Recommendation 23  Please define “stream crossing” culverts in relation to whether it applies only to perennial streams and/or intermittent streams.
The following shows how our original comments in March were addressed as we crafted the proposed October comments.

2. **Inventories** - Please clarify if ALL connected roads (including ones that meet the MRGP road standards and have no erosion issues) need to be inventoried every 5 years: *We removed this comment. DEC clarified this, yes, every 5 years.*

3. **Triggers** - For each of the triggers for improvement identified in the permit, there needs to be clear definitions on the thresholds for “Fully Meets”, “Partially Meets”, and “Does Not Meet.” *We removed this comment. DEC clarified this in Road Erosion Inventory Template.*

4. **Class 4 Roads** – Currently municipalities are not required to maintain Class 4 roads in accordance with 19 V.S.A. § 310 and case law. No permit requirements on municipalities should be established on Class 4 roads unless and until statute is clarified to specifically require this responsibility. We are, however, supportive of doing road erosion inventories of Class 4 roads. Additionally, we are also concerned that requiring maintenance on Class 4 roads, even if it is confined to major erosion problems, could lead to causing more erosion just to get to the site with the right equipment. *We continued with this general theme and added additional recommendations.*

5. **Stone-lined Ditching** - We are concerned that the stone line ditching standards in the draft MRGP creates a discrepancy with the Orange Book standards (i.e. 5% v. 8%). The standard should be consistent across programs to ensure municipalities remain eligible for funding programs including FEMA Disaster Recover funds. We feel strongly that municipalities should not have to try to follow two different sets of standards for connected roads and non-connected roads to avoid these conflicts. *We removed this comment. It appears to be addressed via MRGP BMP requirements for “less than 5%”, 5%-8% and greater than 8%”

6. **Outfalls outside of the ROW**  Often these grass-lined ditches will need to be stabilized well outside of the ROW. The permit should not include requirements on municipalities outside the ROW or easements. The erosion assessments should be clear that they are limited to what is visible from the edge of the ROW or allowed by easement or permission of the property owner. *We clarified this comment which is addressed re, Section 6.2.C*

7. **Culvert Requirements** - Please clearly define the different culverts and associated standards (driveway, conveyance, drainage, stream crossing, etc.). *These comments addressed in Section 10.*

8. **Ditch Definitions** – Please clearly define and/or reduce the number of terms for ditch, swale, and gully. *This comment addressed in Section 10.*
9. **Reporting Cycle** – Change the reporting cycle to once per year instead of twice per year to reduce the administrative burden on the State and municipalities by 50%. There will be minimal work occurring between October to April to report. We would prefer an April reporting date so that municipalities can report what got accomplished the previous construction season and report what has been approved in the budget for the upcoming construction season. **We removed this comment. DEC Consolidated it into one report in February.**

10. **Annual Fee** – A $2,000 flat annual fee is too heavy of a burden for smaller towns. The total amount of fees should be tied to the cost to administer the permit and not generate excess revenue. Fees could be a lower flat fee, be tiered, or be variable depending on the number of connected road segments or road-related impervious cover. There should be some incentive, such as a reduced fee, for towns to complete their road erosion projects in less than the 20-year timeframe. **We restated this comment, re: Section 3.1. above.**

11. **MS4 Fees** – We understand and would like it confirmed that no additional fee charged to MS4 permittees when the MRGP requirements are added to the MS4 permits. **We removed this comment. DEC makes it clear in Part 2.1 Duty to Apply.**

12. **Historic Projects** – Although it may not seem to be directly connected to the MRGP permit going forward, it is our understanding that the State can document and take credit for phosphorous reduction to meet the Lake Champlain TMDL going back to more than 10 or maybe even 15 years ago. We understand that date is 2002 for the stormwater permits vs. two years prior to the permit issuance for the MRGP. It would seem to us that it would be very beneficial to the State to ask for documentation of these prior projects that were done solely by municipalities, with it being optional for the municipalities to provide this information. **We removed this comment, not appropriate venue and yes, DEC is working on this.**

13. **Slope Data** – Recent higher resolution LiDAR (elevation) data is a more accurate source for slope data. There is a chance that fewer roads may be deemed “connected” because of this more accurate data. While this data may not be available statewide yet, we’d like to use it in Chittenden County. Can we re-examine the slope data and provide information back to the State to update your data? **We continued this point in discussion about Part 4.1.**
MEMORANDUM

To: Chittenden County Regional Planning Commission
From: Evan Fitzgerald, Roy Schiff, and Evelyn Boardman
Re: Field Verification Memorandum and Refined Prioritization Methodology
Date: July 14, 2017

Introduction

Our team has developed, refined, and calibrated through field observations a road erosion prioritization methodology using Road Erosion Inventory (REI) data collected by CCRPC during 2016 in eight (8) towns in Chittenden County: Bolton, Essex, Jericho, Huntington, Richmond, St. George, Underhill, and Williston. As part of the methods development, we reviewed, updated and corrected REI data as needed following a thorough QA/QC process in conjunction with Chris Dubin. A summary of the QA/QC process and outcomes was previously summarized in a memorandum to CCRPC dated March 8, 2017. The draft screening methods and results were summarized in a memorandum to CCRPC dated April 12, 2017.

A recap of the key project objectives, as outlined in our scope of work, is provided below.

1. Develop and apply a road erosion prioritization method within each of the municipalities to identify priority sites for mitigation work.
2. Develop conceptual erosion mitigation designs for the highest priority sites in each municipality in support of Better Roads grants. Subsequent grants and restoration projects will in turn help municipalities meet the permit conditions of the VTDEC Municipal Roads General Permit (MRGP).

Outline of Prioritization Method

During our review and QA/QC of the REI dataset, we developed a concept for categorizing REI data based on each variable’s potential impact on stormwater runoff, sedimentation, and overall water quality in adjacent waterways. We organized the data based on water quality processes that indicate sources of sedimentation and transport mechanisms. This approach is similar to other projects in the region to prioritize stormwater and water quality remediation projects (i.e., Critical Source Area analysis). This framework identifies areas with the greatest water quality impacts where there is 1) a source of pollution, and 2) a transport mechanism to move the pollution to nearby waterways, whereby road segments with both source and transport mechanisms have a higher impact rating than those lacking one.

**Figure 1** outlines this concept using the REI data. Source and Transport are defined below in relation to our evaluation of road erosion:

*Source:* The roadway surface and/or right-of-way has areas of soil instability (i.e., rilling on gravel road surface, unstable ditches, gullies) that lead to sedimentation during runoff events.

*Transport:* The road segment has areas of direct discharge (i.e., conveyances) to adjacent or bisecting waterways.
Road Erosion Screening Overview
Hydrologically Connected Roads

- Adequacy of Road Drainage
- Road Slope (LiDAR)*
- Roadway Crown
- Grader Berm

- Poor Drainage Outlets
- Gully Erosion
- Stream/Road Conflicts’*
- Undersized Culverts
- Culverts lacking headers

Notes:
* Indicates non-REI variable calculated in GIS using LiDAR
† Stream/road bank erosion not addressed in MRGP

Road Segments with High Potential for Water Quality Impact

Figure 1. Draft Prioritization Concept
Draft Screening Results and Field Validation

Our initial screening method is described in detail in a memorandum to CCRPC dated April 12, 2017. Each of REI variables included in the screen was assigned a scoring value of 1 for low, 2 for medium, and 3 for high on each hydrologically connected road segment. The final scoring ranges for each road segment depend on whether the road is paved, gravel, or Class 4, as shown in Table 1 for the Source and Transport scores. We reviewed the scoring distributions for the Source and Transport scores by road type, and applied breaks for high, medium, and low. The breaks in ranges were intended to call out the highest 10-15% of road segments as high, and about 50% as low. Final numeric scores were defined with a matrix using the scoring of high, medium, and low for Source and Transport where Source was weighted slightly higher than Transport.

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Number of REI Variables by Type</th>
<th>Lowest Possible Score</th>
<th>Highest Possible Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Source</td>
<td>Transport</td>
<td>Source</td>
</tr>
<tr>
<td>Paved</td>
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<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Gravel</td>
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<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Class 4</td>
<td>9</td>
<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>

Initial Round of Field Validation

We completed initial field validation work in April and early May 2017 to evaluate road segments in Underhill & Richmond (hilly) and Essex & Williston (flatter). We reviewed 60 road segments representing a range of scores in the high, medium, and low categories. Our process was to review both the individual Source and Transport scores, and the combined score, and compare this with our field observations of overall water quality impact potential of the road segment.

Overall, we found that the prioritization method did a decent job of distinguishing between high and medium categories, which will likely be the most important difference for assessing initial priorities for Towns to prioritize projects for water quality improvement, and ultimately meet the MRGP standards. However, we observed the following areas for improvement in the field, which we considered in developing the next iteration of screening refinement:

Overall Scoring

- Source variables appear to drive sediment losses more than transport variables. Source should be weighted higher.
- Segments receiving high scores in the steeper towns (Underhill & Richmond) tended to look worse than segments receiving high scores in flatter towns (Essex & Williston). This is likely related to road slope, and therefore slope should receive higher weight in the screening system (Figure 2).
Figure 2. Left: A high-scoring segment, low slope segment of Lost Nation Road in Essex. Right: A high-scoring, high slope segment of Lower English Settlement Road in Underhill, where a stream channel flows alongside the road with greater risk to water quality.

Variables to consider for higher weights

- Poor conveyances on segments with stream crossings almost always went straight into the stream. Poor conveyances and stream crossings should receive high weights in the screen.

Variables to consider for lower weights

- Roadway crown and grader berm variables are highly temporal, which was confirmed during field visits.
- Road drainage culverts lacking headers likely increase sediment source, but these should not be weighted as high as other Source categories. Similarly, small road drainage and driveway culverts did not appear to be large sources of sediment in the segments examined and should not be weighted as high as other source categories.

Other REI Data Observations

- The gully erosion variable tends to be related to low points in the road, where there is runoff along the shoulder and creates small eroded flow paths through the road shoulder. Where gully erosion locations were identified in the point file, the erosion tends to be of a larger magnitude (i.e. large erosion along a stream channel).

Scoring Revisions and Field Validation

After the initial round of field validation, we refined the overall scoring system before the second round of field validation. In this iteration of the screen, we pulled the slope parameter out of the Source and Transport components and included it as its own unique component to the score. Figure 3 outlines the revised screening concept using the REI data. The Slope score was the raw slope value (0-10%) if the slope was less than or equal to 10% and received a score of 10 if the slope was greater than 10%. Table 2 shows the ranges of the Slope, Source, and Transport scores with this new three-component screen.
Table 2. Ranges for Road Segment Scoring in Second Round Screening

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Number of REI Variables by Type</th>
<th>Lowest Possible Score (all REI variables low or 1)</th>
<th>Highest Possible Score (all REI variables high or 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slope</td>
<td>Source</td>
<td>Transport</td>
</tr>
<tr>
<td>Paved</td>
<td>1</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Gravel</td>
<td>1</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Class 4</td>
<td>1</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>

A composite score for each hydrologically connected road segment was calculated by weighting scaled Slope, Source, and Transport scores and summing the three components. Source and Transport were scaled from their ranges of 8 – 30 and 4 – 12 respectively to a range of 1 – 10 using the formula:

\[
\frac{\text{max}_{\text{scaled}} - \text{min}_{\text{scaled}}}{\text{max}_{\text{raw}} - \text{min}_{\text{raw}}} \times (\text{score} - \text{max}_{\text{raw}}) + \text{max}_{\text{scaled}}
\]

Or

\[
\frac{10 - 1}{\text{max}_{\text{raw}} - \text{min}_{\text{raw}}} \times (\text{score} - \text{max}_{\text{raw}}) + 10
\]

We tested different weights for the three components and compared the resulting scores to target scores we determined during the first rounds of field tours. We found the best results using a weighting scheme of 20% Slope, 20% Transport, and 60% Source. Conceptually, this agreed with our observations that Source mechanisms are the most important factors in driving sediment losses and overall water quality impacts.
Road Erosion Screening Overview
Hydrologically Connected Roads

- Road Slope (LIDAR)*

Entire Roadway

- Adequacy of Road Drainage
  - Roadway Crown
  - Grader Berm

Entire Roadway

- Total conveyances

Slope (20%)

Discrete (point) source

- Poor Drainage Outlets
- Gully Erosion
- Stream/Road Conflicts*
- Undersized Culverts
- Culverts lacking headers

Discrete Runoff or Discharge Points

- Stream Culverts
- Road Drainage Culverts
- Driveway Culverts

Sediment Sources (60%)

Transport (20%)

Road Segments with High Potential for Water Quality Impact

Notes:
* Indicates non-REL variable calculated in GIS using LIDAR
* Stream/road bank erosion not addressed in MRGP

Figure 3. Revised Prioritization Concept
Second Round of Field Validation

We completed the second round of field validation in June to evaluate road segments in Richmond, Huntington, and Underhill. We reviewed 30 road segments representing a range of scores. Our process was to review both the individual Slope, Source, and Transport scores, and the combined score, and compare this with our field observations of overall water quality impact potential of the road segment.

Overall, we found that the prioritization method did an excellent job of distinguishing between high, medium, and low categories. The main discrepancies between the screen and our field validation occurred in the following situations:

- In areas where road or ditch instability had been addressed by the Town after the REI survey was completed in 2016, REI variables collected prior to the work tended to overestimate sediment source and transport potential.

- In areas where a stream was near the road segment but did not cross it and in areas with ditches and channels that had considerable flow but were not considered blue-line streams, the screen tended to underestimate sediment source and transport potential (Figure 4). Once again, we observed that segments with both poor conveyances and a stream crossing or stream nearby tended to generate and deliver more sediment than segments with one of these conditions but not both.

- In areas where the REI data on which the screens were based were different from what we observed in the field the screen tended to both under- and overestimate sediment source and transport potential. This included some areas where more permanent variables (e.g. adequacy of road drainage and poor conveyances) were reported to be worse in the REI data than what we observed in the field. However, most of the discrepancies were in the more temporally variable road crown and grader berm variables.

Figure 4. Repaired pavement on Wes White Road in Richmond where a channel with flowing water is alongside the road.

Final Scoring System

Following our June 2017 field validation tours, we made minor changes to the weights of the individual variables that make up the Source and Transport components of the overall screen. After assigning REI variables included in the screen a scoring value of 1 for low, 2 for medium, and 3 for high on each hydrologically connected road segment, we weighted the scores based on the importance of each variable to sediment and pollutant source and transport mechanisms. The determinations and weights shown in Table 3 were made based on field observations, prior knowledge, and professional judgment of the permanence and magnitude of water quality impacts from problem areas. Table 4 shows the ranges possible for Slope, Source, and Transport scores before scaling, weighting, and summing to determine an overall score as described in the previous section.
Table 3. Weighting of Individual Variables used in Road Segment Scoring in Final Screening

<table>
<thead>
<tr>
<th>Component</th>
<th>Variable Description</th>
<th>Scoring Importance</th>
<th>Scoring Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope</td>
<td>Road Slope</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Adequacy of Road Drainage</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Roadway Crown</td>
<td>Low</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>Grader Berm</td>
<td>Low</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>Total Poor Conveyances (Road Drainage Outs)</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td>Source</td>
<td>Road Drainage Culvert Outlet Stability</td>
<td>Moderate</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>Gully Erosion Locations</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Stream and Road Conflicts</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total Road Drainage Culverts Less than 18 Inches in Diameter</td>
<td>Low</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>Total Road Drainage Culverts Lacking Header(s)</td>
<td>Low</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>Total Driveway Culverts Less Than 15 Inches in Diameter</td>
<td>Low</td>
<td>0.33</td>
</tr>
<tr>
<td>Transport</td>
<td>Total Conveyances (Road Drainage Outs)</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Stream Culverts</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total Road Drainage Culverts</td>
<td>Moderate</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>Total Driveway Culverts</td>
<td>Moderate</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Table 4. Weighting of Individual Variables used in Road Segment Scoring in Final Screening

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Number of REI Variables by Type</th>
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<td>4</td>
</tr>
</tbody>
</table>

Attached is a table where we recorded our observations from both rounds of field validation, and two 24” x 36” maps. One map shows revised prioritization results for the Town of Underhill, and a second map shows the locations segments visited during the field validation. Between both field validation trips, we visited approximately 90 road segments representing 5% of the hydrologically connected road segments in the REI database for the 8 Towns in the study.
CCRPC Transportation Advisory Committee
October 3, 2017
Agenda Item 5: Information Item

Metropolitan Transportation Plan (MTP) Update

Background:
Staff has started developing and running the various MTP transportation scenarios using the recently updated regional travel demand model. At the October TAC meeting we will present and discuss model results for Scenarios A and D. All scenarios are briefly described below. Please note that Scenarios A through D are narrowly focused on a specific issue/mode/strategy/future and that the MTP scenario will be a hybrid of these scenarios and will include multimodal projects/improvements and other strategies.

- **Scenario A**: Vehicle capacity scenario that focuses on roadway projects (see attached charts and maps of interchange analyses)
- **Scenario B**: Technology Intensive scenario that includes connected and autonomous vehicles by 2050.
- **Scenario C**: TDM scenario that includes a robust increase of transit and bike/pedestrian facilities and travel.
- **Scenario D**: The two land use scenarios included in this packet are: **D1** – 90% of the household (HH) growth is allocated to TAZs that correspond to the center and village planning areas for all towns; and **D3** – 10% increase in overall HHs in Chittenden County. Additional growth is allocated proportionally to TAZs so that roughly 95% of HH growth falls within our areas planned for growth as specified in the ECOS Plan. (see attached charts)
- **MTP Scenario**: Hybrid scenario which combines multimodal projects and other strategies from Scenarios A through D.

Please note that the 2050 HH and population forecasts for Chittenden County, approved by the CCRPC Board in the spring of 2017, are 79,151 and 183,172 respectively.

**Staff contact:** Peter Keating, pkeating@ccrpcvt.org

Jason Charest, jcharest@ccrpcvt.org
Figure X-X: 2050 AM & PM Peak Hour Congestion w/TIP Projects & Full Exit 15

Congestion Levels (v/c ratio):
- Light Congestion (0.70 - 0.79)
- Moderate Congestion (0.80 - 0.89)
- Severe Congestion (0.90 - 1.00)
- Over Capacity (> 1.00)

Sources:
- Town Boundary and Water Body - VCGI
- Major Roads and Railroad - VTrans
- 2050 v/c data exported from TransCad.

Disclaimer:
Errors and omissions may exist. The Chittenden County Regional Planning Commission is not responsible for errors. Questions of on-ground location can be resolved by site inspections and/or surveys by registered surveyor. This map is not sufficient for engineering studies. It is not a replacement for surveyed information or engineering studies.
I-89 Exit 17

See Inset Above Right

I-89 Exit 11

2050 w/TIP Projects & Exit 13 Loop

Congestion Levels (v/c ratio)

- Light Congestion (0.70 - 0.79)
- Moderate Congestion (0.80 - 0.89)
- Severe Congestion (0.90 - 1.00)
- Over Capacity (> 1.00)

Railroad

Figure X-X: 2050 AM & PM Peak Hour Congestion w/TIP Projects & Exit 13 Loop
Figure X-X: 2050 AM & PM Peak Hour Congestion w/TIP Projects & Exit 12B
Countywide Daily Transit, Walking & Biking Mode Split

Percent

2015, 2025 No Build, 2025 w/TIP, 2050 No Build, 2050 w/TIP, 2050 w/TIP & Exit 12B, 2050 w/TIP & Full Exit 13, 2050 w/TIP & Full Exit 15, D1 (90%), D3 (10% increase in HHs)
Countywide Daily Average Length of Trip (distance)

- 2015
- 2025 No Build
- 2025 w/TIP
- 2050 No Build
- 2050 w/TIP
- 2050 w/TIP & Exit 12B
- 2050 w/TIP & Full Exit 13
- 2050 w/TIP & Full Exit 15
- D1 (90%)
- D3 (10% increase in HHs)