



February 8, 2023

Overnight Mail/Email (rgendreau@sturbridge.gov)

Sturbridge Conservation Commission
301 Main Street
Sturbridge, MA 01566

Re: NOI Supplemental Letter
Blueberry Hill Estates
Lot 3 Berry Farms Road
Sturbridge, Massachusetts

[LEC File #: MCEI\20-002.04]

Dear Members of the Commission:

On behalf of the Applicant, Justin Stelmok, LEC Environmental Consultants, Inc., (LEC) is submitting supplemental materials for the previously filed Notice of Intent (NOI) Application for the proposed 55+ Housing Community ("Manufactured Housing Community"). Based on past discussions and peer reviews, the following are included for the new NOI Application:

Peer Reviews

- Oxbow Associates, Inc. (Oxbow) Peer Review, dated June 17, 2022
Oxbow Peer Review, dated July 14, 2022
Oxbow Peer Review, dated August 25, 2022
Oxbow Peer Review, dated December 23, 2022
Pare Corp Peer Review, dated November 29, 2022

New Information

- Response to DEP Comments (DEP #CE300-1150) McClure Engineering, Inc., dated January 25, 2023
Reduced Salt Application Plan, dated February 8, 2023, including accompanying MassDOT's Reduced Salt Policy (April 1, 2014) & NHDES' Best Management Practices and Salt Use Minimization Efforts in Chloride-Impaired Watersheds of New Hampshire (2020)
Vernal Pool Monitoring Plan, prepared by LEC, dated February 8, 2023

Thank you for consideration of this supplemental information. Please do not hesitate to contact me if you have any questions in advance of the February 16, 2023 Public Hearing.

Sincerely,

LEC Environmental Consultants, Inc.

Brian T. Madden signature

Brian T. Madden
Senior Wildlife/Wetland Scientist

Attachments

Table with 5 columns: LEC Environmental Consultants, Inc., www.lecenvironmental.com, 12 Resnik Road Suite 1 Plymouth, MA 02360 508.746.9491, 380 Lowell Street Suite 101 Wakefield, MA 01880 781.245.2500, 100 Grove Street Suite 302 Worcester, MA 01605 508.753.3077, P.O. Box 590 Rindge, NH 03461 603.899.6726, 680 Warren Avenue Suite 3 East Providence, RI 02914 401.685.3109, PLYMOUTH, MA, WAKEFIELD, MA, WORCESTER, MA, RINDGE, NH, EAST PROVIDENCE, RI



June 17, 2022

Sturbridge Conservation Commission
c/o Ms. Rebecca Gendreau
Conservation Agent
Town of Sturbridge
301 Main Street
Sturbridge, MA 01566

**RE: Peer Review of Notice of Intent Application and Habitat Evaluation
DEP File No. 300-1113
30 Main Street, Lot 3 (Parcels 415-03914-030 & 280-03534-020)
Sturbridge, MA**

Dear Ms. Gendreau and Members of the Commission:

The Sturbridge Conservation Commission (SCC) has engaged Oxbow Associates, Inc. (OA) to review the Notice of Intent application and associated site plans submitted by the Applicant, Justin Stemlok, dated April 5, 2022, for the construction of a 55+ housing community and associated roadways, parking, and amenities, located on portions of two parcels adjoining properties at 30 Main Street and 20 Fiske Hill Road, in Sturbridge, MA (the "Site;" Assessors Parcels 280-03534-020 & 415-03914-030). Brian T. Madden of LEC Environmental Consultants, Inc. and Peter Engle, P.E. of McClure Engineering, Inc. are representing the Applicant.

A. Methodology

This report analyzes project information provided to the SCC, including proposed site plans titled "Special Permit and Site Plan" ("Site Plans"; Pages 1-30) dated April 1, 2022, and proposed impacts to observed onsite conditions. The purpose of this assessment is to evaluate the information submitted to the SCC complies with the MA Wetlands Protection Act (WPA; M.G.L. c. 131, s. 40, the "Act") and implementing Regulations (310 CMR 10.00), as well as the Town of Sturbridge Wetland Protection Bylaw (Chapter 286), and its Regulations (Chapter 365).

OA staff (specifically R. Strohsahl) reviewed the 41± acre Site on June 14, 2022. OA conducted meandering surveys throughout the proposed development area to document potential adverse impacts to the wetland systems and vernal pools and evaluate impacts to their respective buffer zones.

B. Observations

Wetlands Protection Act

The Wetland Protection Act Regulations provide protection to eight public interests as they relate to jurisdictional wetland resource areas. The interests include protection of public and private

water supply, protection of groundwater supply, flood control, prevention of storm damage, prevention of pollution, protection of land containing shellfish, protection of fisheries, and protection of wildlife habitat. The engineering review will provide guidance on the water protection and stormwater management. OA has focused on protection of wildlife habitat on the Site and the impacts to the vernal pools located within the wetland resource areas surrounding the property.

The presence of wildlife in a wetland resource area and buffer is not the sole factor in evaluating wildlife habitat value. Plant community composition and structure, hydrologic regime, or other characteristics providing “important” features for wildlife must be present. Specifically, it is habitat value and not a particular wildlife species (with the exception of rare species) that is protected by the Act. As habitat features within the proposed impact areas were observed, these same features were examined for indications of specific or general habitat for wildlife. Attributes such as burrows and cavities were actively searched for and the physiographic features of the proposed impact area and surrounding habitat were noted.

Habitat Continuity and Quality

The Site is located at the southern edge of a mostly contiguous zone of forested habitat encompassing approximately 2,000± acres that is generally located south of Route 20, west of the Southbridge Airport and east of Fiske Hill Road. Directly to the south of the site is Main Street, a highly developed roadway, while on either side to the east and west are housing subdivisions. The contiguous area appears to be generally composed of forested upland interspersed with small streams, wetland systems, a utility ROW, and sporadic housing. The lack of development north of the property allows wildlife such as small and large mammals, forest interior nesting birds, reptiles, amphibians, and invertebrates to move freely through the environment and without human disturbance from roads or highways, or other residential or commercial development.

Habitat on the Site is typical of a forested upland habitat with previous anthropogenic impacts due to logging. There is a hardwood tree community that has been selectively harvested, leaving various species of tree specimens at their natural height, a number of dead tree snags, as well as previously cleared areas that are currently exhibiting successional regrowth. OA noted that throughout the Site there were very few areas that do not have any vegetative cover.



Photo: Successional growth in previously cleared timber harvesting area increases habitat diversity



Photo: Tree cavities excavated and used by forest interior birds or small mammals

The diversity of different stages of successional growth throughout the property allows for a variety of habitat uses by more wildlife than that which would exist in a monoculture or single habitat (forested) community. The variety of different plants and shrubs create food and cover sources that would otherwise not exist within previously existing forest, providing more niches for

a variety of wildlife to use. As a result, the diversity of wildlife on the Site has likely increased following the prior logging operations.

Following timber harvesting, and during primary successional growth it is typical to see various invasive plant species beginning to sprout along the borders of the cleared areas or along access roads. Invasive plants are typically transferred by human activity and machinery or deposited by birds as they occupy the fringe habitat between the forest and clearings. During our inspection OA observed that there were very few invasive plant species located on the Site. OA did not observe any Asiatic bittersweet (*Celastrus orbiculatus*), a common invasive throughout Massachusetts, and only documented 1-2 plants of Japanese barberry along a logging road. While OA did not fully explore the entirety of every logging road, the lack of readily observable invasive plants was noteworthy.

Wildlife Habitat

Within the 100-foot and 200-foot BVW buffer zones, including several areas proposed to be impacted, OA observed numerous standing dead trees that can serve as perches or can contain cavities for bird nesting and other wildlife use. In multiple locations throughout the property OA documented dead tree snags with cavities with evidence of animal use, either by bird species or small mammals. As some of the dead trees are greater than 50 feet in height it was difficult to observe all potential habitat features of the trees. As tree limbs break and deteriorate with the elements, they can create hollows in the limbs that are directed horizontally or vertically, and therefore not visible from the ground.



Photos: (L) dead standing tree that provides perching locations (R) tree cavities can be used by a variety of different species

The woody debris from slash piles and from fallen or damaged trees scattered throughout the Site can also provide cover for a variety of small mammals, reptiles and amphibians, and

invertebrates. OA documented a downed and cut tree trunk that contained a hollowed center that was being used by small mammals (either chipmunk [*Tamias striatus*] or grey squirrel [*Sciurus carolinensis*]) to cache food. Under the same log OA documented a red-backed salamander (*Plethodon cinereus*) utilizing a network of tunnels created by a vole or small mammal, and multiple species of insects.



Photos: (L) Interior of hollow log showing food cache of small mammal (R) red-backed salamander under same log.

The access roads are also utilized by a variety of mammals, and evidence of white-tailed deer (*Odocoileus virginianus*), racoons (*Procyon lotor lotor*), beaver (*Castor canadensis*), and coyotes (*Canis latrans*) were numerous throughout the property.



Photo: (L) Evidence of prior beaver activity near wetland series E. (R) chipmunk (center) utilizing slash remnants and rock crevices

Sturbridge Wetland Protection Bylaw

Under the Sturbridge Wetland Protection Bylaw, vernal pools are protected whether certified by the MA Natural Heritage and Endangered Species Program (NHESP) or not. The pools and the 100-foot buffer zone originating from the Mean-Annual High-Water line are considered resource areas as they provide critical, and often isolated, habitat for amphibian breeding. An additional 100-feet of buffer zone is regulated by the SCC to protect the resource area.

The Applicant's representatives have completed an inventory of the vernal pools on Site during the appropriate season and documented successful amphibian breeding. The physical attributes

of the pools are suitable for successful breeding by mole salamanders and the adjoining dry, ledge, terrestrial forested landscape provides suitable non-breeding habitat to support the remainder of the life cycle.

A publication reviewing multiple studies of migratory trends among diverse Ambystomatid (“mole”) salamanders concluded that 95% of mole salamanders generally reside and remain within a 540±-foot (164 m) area extending from the vernal pool edge (Semlitsch 1998). A New England based field study concluded only 82 percent of spotted salamanders are contained in the 164 m threshold. All vernal pool amphibians transport their biomass, derived from the vernal pool, into the surrounding terrestrial habitat. That process increases forest biomass in the vicinity of pools; all amphibians are predators and vernal pool species are also prey for diverse predators.

The Site currently has two vernal pools that are separated by approximately 450± horizontal feet. The current project design has a roadway and several dwellings designed to bisect the area between the vernal pools. The road and housing design would require clearing trees within the 200-foot buffer to each of the vernal pools. Rittenhouse et al. (2006) conducted a study on spotted salamanders (*Ambystoma maculatum*) to monitor salamander movement from forested habitat to an adjacent grassland. The results showed that the mole salamanders moved freely throughout the forested environment but avoided a habitat edge approaching the grassland and actively avoided the grassland environment.

Under Section 365-1.3A of the Bylaw, it states that there must be no significant adverse impacts on the resource areas. The tree clearing required for the roadway and housing development will impact connectivity between amphibian species utilizing the two vernal pools, isolating the existing populations and removing viable non-breeding season habitat used by species from both pools. Additionally, the roadway is a location for potential amphibian mortality, especially during migration events associated with breeding season. We recommend that the SCC explore methods that keep the connectivity of the pools intact, with wildlife barriers and open grate trenches beneath the road, or other wildlife crossing options. In addition, we recommend that the SCC request that the Applicant protect some of the existing trees specifically between the two vernal pools to prevent the habitat edge that prevents salamander movement.

C. Site Plans

In review of the Site Plans, OA noted some inaccuracies within the planting specimen species’ list that should be remedied prior to the issuance of an Order of Conditions. The Site Plans reference a number of planting species that are non-native or invasive to Massachusetts. We have recommended similar species to the proposed that can be substituted in the table below.

	Proposed Species	Recommended Species
Roadways	Norway maple (<i>Acer platanoides</i>)	red maple (<i>Acer rubrum</i>) or sugar maple (<i>Acer saccharum</i>)
	silver linden (<i>Tilia tomentosa</i>)	American linden (<i>Tilia americana</i>)
	honey locust (<i>Gleditsia triacanthos</i>)	gray birch (<i>Betula populifolia</i>)
Rain gardens	bird's foot trefoil (<i>Lotus corniculatus</i>)	cinnamon fern (<i>Osmunda cinnamomea</i>)
	blue cardinal flower (<i>Lobelia siphilitica</i>)	cardinal-flower (<i>Lobelia cardinalis</i>)

OA also recommends consideration to use the seed mix from New England Wetland Plants, Inc. specifically designed for detention/infiltration basins within the basins, as opposed to the Conservation/Wildlife mix currently proposed, produced by the same company.

OA recommends the SCC suggest incorporating an invasive species monitoring and treatment plan into the Operations and Maintenance Plan for the rain gardens, detention basins, and any other common areas.

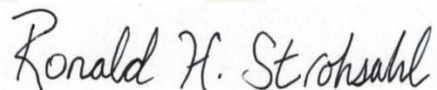
D. Conclusions and Recommendations

The buffer zone surrounding the wetland resource areas provide abundant wildlife habitat opportunities to a variety of different species. The proposed development project will likely impact the connectivity of the wetland systems and vernal pools located on the Site. The SCC should consider methods to prevent isolating populations that use the adjacent vernal pool habitat.

Thank you for the opportunity to provide these comments. The Commission should feel free to contact me at 978-929-9058 ext. 107, with any questions regarding this review.

Sincerely,

Oxbow Associates, Inc.



Ron Strohsahl, PWS
Senior Wetland Scientist

Citations

McDonough, C. and P. W. C. Paton. 2007. Salamander Dispersal Across a Forested Landscape Fragmented by a Golf Course. *J. Wildlife Management*. 71(4), 1163-1169.

Rittenhouse, T. A. G. and R. D. Semlitsch. (2006). Grasslands as movement barriers for a forest-associated salamander: Migration behavior of adult and juvenile salamanders at a distinct habitat edge. *Biol. Cons.* 131:14-22.

Semlitsch, R. D. (1998). Biological delineation of terrestrial buffer zones for pond-breeding salamanders. *Conservation Biology* 12(5), 1113-1119.



July 14, 2022

Sturbridge Conservation Commission
c/o Ms. Rebecca Gendreau
Conservation Agent
Town of Sturbridge
301 Main Street
Sturbridge, MA 01566

**RE: Peer Review of Supplemental Materials
DEP File No. 300-1113
30 Main Street, Lot 3
Sturbridge, MA**

Dear Ms. Gendreau and Members of the Commission:

OA has reviewed the supplemental materials prepared and submitted by LEC Environmental Consultants to the Commission on July 7, 2022. OA was also present at the site walk on July 14, 2022, where the proposed design and proposed plan amendments were reviewed with the Applicant, their representative, and members of the Commission.

The Sturbridge Wetlands Regulations (Chapter 365) stipulate that the adjacent upland area extending 200-feet from the boundary of a vernal pool is considered a *resource area*. As such, proposed impacts to the 200-foot vernal pool buffer should be considered equivalent to proposing impacts within a Bordering Vegetated Wetland (BVW), or similar, and their impacts minimized to the greatest extent possible. The Regulations (Section 365-5.6.E) state that any work within the 200-foot buffer zone to a vernal pool,

“shall not result in a measurable decrease in extant wildlife populations or biological community composition, structure, and species richness of the site or in the vicinity...or impair, damage, or reduce in value for wildlife purposes identified specific habitat features.”

Thus, it is the burden of the Applicant to ensure that the proposed project does not cause a significant adverse impact to the function of a vernal pools or the surrounding adjacent upland resource areas.

The Commission should consider maximizing the available protection of the adjacent upland resource areas to ensure the biological functionality of the three vernal pools is not reduced, ensure landscape connectivity and continuity between the wetland systems is kept intact to the most reasonable degree, and limit indirect effects to important abiotic vernal pools characteristics (potential chemical changes affecting pH, salinity, light, temperature, etc.).

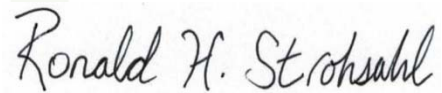
Any structures designed to transfer wildlife under the proposed roadway should be accompanied by latest available research indicating that the proposed size, and moisture and light regime is appropriate for reptile and amphibians crossing, as well as common wildlife that cannot traverse a busy roadway and may use the wetland systems habitats. These structures should also have a

naturalized bottom and have scheduled maintenance within the O&M plan to ensure they stay accessible at all times of the year. Some guidance can be found within MassDOT road construction guidelines for reducing road mortalities.

Thank you for the opportunity to provide these comments. The Commission should feel free to contact me at 978-929-9058 ext. 107, with any questions regarding this review.

Sincerely,

Oxbow Associates, Inc.

A handwritten signature in black ink that reads "Ronald H. Strohsahl". The signature is written in a cursive style with a large initial 'R'.

Ron Strohsahl, PWS
Senior Wetland Scientist



August 25, 2022

Sturbridge Conservation Commission
c/o Ms. Rebecca Gendreau
Conservation Agent
Town of Sturbridge
301 Main Street
Sturbridge, MA 01566

**RE: Peer Review of Supplemental Materials
DEP File No. 300-1113
30 Main Street, Lot 3
Sturbridge, MA**

Dear Ms. Gendreau and Members of the Commission:

OA has reviewed the supplemental materials prepared and submitted by LEC Environmental Consultants to the Commission on August 18, 2022. OA has prepared additional comments to address the adjustments made to the proposed project.

Project Changes

The Applicant has increased the amount of protected land as a migratory corridor between vernal pools A and E by eliminating a structure on an additional lot (Unit #67) and adjusting the orientation of the structures on lots adjacent to the corridor. The Applicant has also increased the size of the crossing structure proposed beneath the roadway from 2x2 feet to 5x3 feet to allow for wildlife movement and increase the amount of light into the crossing structure.

Siting previous language from the Commission, the Applicant has also removed the curbing/walls that were to be used to direct wildlife towards the crossing structure. The edges of the proposed lots will be graded to match existing grades of the migratory corridor. Differences in existing grades and proposed grades surrounding the crossing structure necessitate the use of a retaining wall on the south side of the roadway.

Recommendations

Crossing Structure

With the elimination of the curbing/retaining walls to direct migrating wildlife towards the crossing structure, OA recommends the Commission explore the feasibility of additional crossing structures to bypass beneath the roadway, or the possibility of a grated bridge (see Photos) spanning a larger proportion of the migratory corridor to ensure that wildlife do not bypass the opening of the crossing structure.

Vernal Pool A – Buffer Zone Impacts

The Applicant has stated that the proposed project will not result in significant adverse impact to the on-site vernal pools. While the Applicant has removed themselves from the 200-foot Vernal Pool Buffer on the north side of the proposed roadway (Vernal Pool E), there are substantial impacts within the 200-foot buffer on the south side of the roadway, including four housing units, their accessory structures, the associated yards/lawn, and the construction of a detention basin.

The table located on Page 2 of the supplemental LEC letter (dated Aug. 18, 2022) depicting detailed impact calculations does not include a percentage of impacts to the vernal pool buffer outside of impervious surfaces. As previously mentioned in a previous OA letter (June 17, 2022) the study by Rittenhouse et al. (2006) shows that salamander movement is also limited by fragmentation of forested habitat. While the lawn/grassland proposed on the property may eventually be vegetated, it remains a barrier to dispersal and migration to vernal pool amphibians, as it exposes them to dehydration, predation, roadway crossings, and other human activities, which may ultimately result in population decline. The Applicant should demonstrate how the proposed work within the 200-foot buffer will not substantially reduce or impair the adjacent upland resource areas, and if the proposed work in this area is necessary to the success of the overall project.

As previously mentioned, the Bylaw states:

“shall not result in a measurable decrease in extant wildlife populations or biological community composition, structure, and species richness of the site or in the vicinity...or impair, damage, or reduce in value for wildlife purposes identified specific habitat features.”

Minor abiotic changes to vernal pool habitat can result in changes to the hydrology of the vernal pool and interfere with growth and development of vernal pool species. The Applicant has not demonstrated that the rain gardens/detention basin will sufficiently prevent road pollution (oil, gasoline, deicer, salt, etc.) from runoff from infiltrating groundwater and ultimately changing abiotic factors of the pools. Over multiple years accumulating soluble chemicals/salts from road runoff will be deposited in the soils of the rain gardens and will inevitably result in an increase in groundwater levels infiltrating to the vernal pools, especially towards Vernal Pool A. As demonstrated in the study by Langhans et al. (2009) even minor increases in salt concentrations resulted in decreased survivorship or wood frog (*Rana sylvatica*) tadpoles.

The Commission should consider maximizing the available protection of the adjacent upland resource areas to ensure the biological functionality of the three vernal pools is not reduced, ensure landscape connectivity and continuity between the wetland systems is kept intact to the most reasonable degree, and limit indirect effects to important abiotic vernal pools characteristics (potential chemical changes affecting pH, salinity, light, temperature, etc.).

Thank you for the opportunity to provide these comments. The Commission should feel free to contact me at 978-929-9058 ext. 107, with any questions regarding this review.

Sincerely,

Oxbow Associates, Inc.

Ronald H. Strohsahl

Ron Strohsahl, PWS
Senior Wetland Scientist



References

Langhans, Margaret, Bridget Peterson, Annie Walker, Geoffrey R. Smith & Jessica E. Rettig (2009) Effects of Salinity on Survivorship of Wood Frog (*Rana sylvatica*) Tadpoles, *Journal of Freshwater Ecology*, 24:2, 335-337.

Rittenhouse, T. A. G. and R. D. Semlitsch. (2006). Grasslands as movement barriers for a forest-associated salamander: Migration behavior of adult and juvenile salamanders at a distinct habitat edge. *Biol. Cons.* 131:14-22.

Photographs



Photo 1: Grated bridge spanning BVW between two vernal pools supporting rare amphibians.
Source: Oxbow Associates, Inc.



December 23, 2022

Sturbridge Conservation Commission
c/o Ms. Rebecca Gendreau
Conservation Agent
Town of Sturbridge
301 Main Street
Sturbridge, MA 01566

**RE: Peer Review of Notice of Intent Filing
Blueberry Hill Estates – Lot 3 Berry Farms Road
20 Fiske Hill Road & 30 Main Street
Sturbridge, MA**

Dear Ms. Gendreau and Members of the Commission:

Oxbow Associates, Inc. (OA) has reviewed the original filing for this matter (DEP File No. 300-1132), submitted in April of 2022, the supplemental materials submitted during the review process, and the latest Notice of Intent materials prepared and submitted by LEC Environmental Consultants to the Sturbridge Conservation Commission (SCC) on November 10, 2022.

At this time, we believe that the Applicant and the SCC have commented on or addressed previous recommendations to the wildlife crossing structure size, quantity, alternatives, as well as potential impacts to the vernal pools via stormwater runoff, which can be reviewed in the previous comments from OA (reports dated June 17, July 14, and August 25, 2022).

The updated limits of proposed Open Space associated with the project and on the adjacent lot (Lot 4) appear to preserve the immediate habitat surrounding the vernal pools, their associated Bordering Vegetated Wetlands (BVW), and intermittent stream channels that connect them.

Recommendations

OA is providing the following recommendations to monitor effects of the housing community on the existing vernal pool amphibian populations and to ensure the long-term viability of the vernal pool functionality on and adjacent to the proposed project.

NHESP Certification

According to data collected prior to the Notice of Intent submittal, the three vernal pools located on or adjacent to the site (northerly and southerly A-series, and E-series vernal pool) all meet the required criteria to be certifiable vernal pools due to the presence of requisite obligate species. OA recommends that the SCC require as part of an Order of Conditions that the vernal pools located on or adjacent to the property be certified with the Natural Heritage and Endangered Species Program (NHESP) at Massachusetts Department of Fish and Wildlife. Certification will provide additional protections under state and federal laws, in addition to the Wetland Protection

Act (the "Act", MGL Ch. 131, §40) and its implementing Regulations (310 CMR 10.00), and the Sturbridge Wetlands Protection Bylaw (Chapter 286) and its Regulations.

Vernal Pool Monitoring

OA recommends that the SCC encourage or require a multi-year monitoring plan to document any changes to the amphibian or invertebrate populations present in the existing vernal pools and to note any abiotic changes resulting from the construction of the proposed housing project. OA believes this can be accomplished with a vernal pool survey completed during the spring amphibian breeding season to observe and document the biological community associated with each pool. Collected data should mirror the information gathered for certification purposes, and a report should be provided to the Conservation staff for review following each survey. Data on abiotic characteristics should be included in the report to highlight any abnormal results. The results may provide insight as to the effectiveness or adequacy of the protective measures implemented under the Bylaw.

Documented conditions over a period can provide information regarding any necessary adjustments to project methodologies or operations practices.

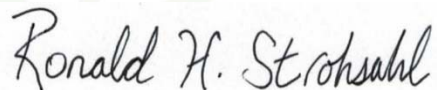
Summary

The Commission should consider maximizing the available protection of the adjacent upland resource areas to ensure the biological functionality of the three vernal pools is not reduced, ensure landscape connectivity and continuity between the wetland systems is kept intact to the most reasonable degree, and limit indirect effects to important abiotic vernal pool characteristics (potential chemical changes affecting pH, salinity, light, temperature, etc.). Certifying the aforementioned vernal pools will provide additional protections to maintain the biological communities within them, and a multi-year monitoring plan can be used to identify aberrations in water quality, chemistry, or hydrology, prior to any irreparable damage.

Thank you for the opportunity to provide these comments. The Commission should feel free to contact me at 978-929-9058 ext. 107, with any questions regarding this review.

Sincerely,

Oxbow Associates, Inc.



Ron Strohsahl, PWS
Senior Wetland Scientist



MEMORANDUM

DATE: November 29, 2022

TO: Jean Bubon, AICP, Town Planner

CC: file

FROM: John P. Shevlin, P.E.

**Re: Engineering Review Services
Blueberry Hill Estates-Site Plan & Special Permit
30 Main Street/20 Fiske Hill Road
Sturbridge, Massachusetts
(Pare Project No.: 22088.00)**

Pare Corporation had completed our review dated May 20, 2022 on the Special Permit and Site Plan Approval application submitted by Fiske Hill Realty Trust for the construction of a 55+ manufactured housing community within the cul-de-sac subdivision on the site located at 30 Main Street and 20 Fiske Hill Road. The site consists of 71 units with optional garages, a clubhouse, open space for residents and a storm water system. The community will be privately owned and maintained after completion. The Subdivision Plan was approved by the Planning Board in 2021.

Pare has been provided the additional following information for review:

- Special Permit and Site Plan “Blueberry Hill Estates, 55+ Manufactured Housing Community Lot 3 Berry Farms Road” – Sturbridge, Massachusetts: Applicant Justin Stelmok. Plans dated 4/1/22 with a revision date of 11/10/22. Plan prepared by McClure Engineering.
- Stormwater Management Report dated March 31, 2022 with a revision date of November 9, 2022 prepared by McClure Engineering, Inc.
- Response to comments dated November 10, 2022 prepared by McClure Engineering

Pare offers the following pertaining to this revised submission in bold below.

PLANS

1. *Sheet C-1- Title Sheet*- Fix spelling of “Manufactured”,
Comment addressed.
2. *Sheet C-1- Title Sheet* – Owner is referenced as both Justin Stelmok and Fisk Hill Realty Trust. Please clarify.
Comment addressed.
3. *Sheet C-1- Title Sheet* – Please modify Drawing Index to match plan sheets:
 - C-15 thru C-18: “Phasing and Erosion Control Plans” should be “Erosion and Sediment Control Plans”.
Comment addressed.

- Add Sheet C-19 “Phasing Plan”.
Comment addressed.
 - Plan & Profile Sheets should be sheets C-20 thru C-23.
Comment addressed.
 - “Construction Details” should be “Site Details”. Should also be labelled sheets C-24 thru C-30.
Comment addressed.
4. *Sheet C-3 thru Sheet C-5 Existing Conditions* – Show test pit locations on plans.
Comment addressed. Test pit locations have been added to the Existing Conditions Plans.
 5. *Sheet C-7 Layout and Materials Plan* – Cul-de-sac for Proposed Drive C exceeds 500 feet.
Pare considers a cul-de-sac as a dead-end street. Per Section 350-4.2.E.2 of the subdivision regulations, dead end streets shall be no longer than 500 feet. Proposed Drive C is approximately 700 feet. Clarification is being requested by the Town Planner and/or Planning Board from the applicant. If agreed that the maximum length is 500 feet the applicant will be looking for a waiver.
 6. *Sheet C-7 Layout and Materials Plan*- Label width of Proposed Drive A.
Comment addressed.
 7. *Sheet C-7 and C-8: Layout and Materials Plan*- Is Drive A considered a major road? If so is radii of 150’ acceptable?
After further review of the “Manufactured Housing Communities” regulations, in particular Section 199-6 E, Regulations, “All manufactured housing communities shall be served by a hard-surfaced road, not less than 20 feet in width and with a radius at all turns of not less than 50 feet...”). The application exceeds this requirement.
 8. *Sheet C- 7 thru C-9: Layout and Materials Plan* – Curb radii shown as 20 feet. Minimum radius should be 30 feet.
All radii at intersecting streets have been revised to 30 feet.
 9. *Sheet C-7 thru C-10: Layout and Materials Plan* - Lot lines with areas, frontage and depth dimensions should be provided.
Areas, frontages and depths have been added to each lot.
 10. *Sheets C-7 thru C-10*: Show bound locations on plan and provide a detail.
Clarification is being requested of the Planner and/or the Planning Board related to the need for bounds.
 11. *Sheets C-7 thru C-10*: Locations for snow storage have been added to the plans. A note should be added that “Snow storage will not be allowed in the bioretention areas.” This has been addressed in the O&M Plan.
 12. *Sheet C-8: Layout and Materials Plan*- Label width of Drive A.
Width of 20’ has been added to the plan.
 13. *Sheet C-8: Layout and Materials Plan* – Label square footage of clubhouse. Should be 1,500 square foot minimum.
Square footage of clubhouse has been revised.
 14. *Sheet C-9: Layout and Materials Plan* – Label Drive A. Provide width.
Width of 20’ has been added to the plan.
 15. *Sheets C-11 thru C-14: Grading and Drainage Plans*- In general, the design concept for the stormwater layout is acceptable. Confirmation of many of the grades and elevations were difficult to review due to clarity of numbers.
Plans have been revised for clarity.
 16. *Sheet C-19 Phasing Plan* – Please clarify the limits of some of the phasing There is a Phase 1 identified in the area of the intersection of Drive A and Drive C. A separate colored Phasing Plan was provided. Please clarify which is correct. If necessary modify the plan set.

The phasing plan has been modified and clarified. However, Phase 1B ends near the intersection with Drive B. Phase 1 continues easterly. Is there a turnaround for the work done east of Drive B in Phase 1?

17. *Sheet C-20: Plan and Profile Drive A:* The 2% grade at the intersection with Berry Farm Road should be extended to at least 100 feet.

The applicant is requesting a waiver for the leveling area as required under the subdivision regulations. The 3% grade proposed will extend approximately 20 feet from the gutter line when it will enter a vertical curve which has a 6.8% down gradient grade. AASHTO provides guidance that the approach should be designed with a relatively flat grade and the maximum grade on the approach leg should not exceed 5 percent where practical. Where ice and snow may create poor driving conditions, the desirable grade on the approach leg should be 0.5 percent with no more than 2 percent wherever practical.

18. *Sheet C-21: Plan & Profile Drive A-* due to length of cul-de-sac and waterline dead end does waterline need to be looped. Review with the water department.

Applicant has stated that the Water Department and DPW has reviewed the plan and neither had issues with the dead end water line.

19. *Sheets C-20 thru C-23: Plan & Profiles-* Label centerline elevations on profiles.

Proposed elevations have been added to the profiles.

20. *Sheet C-24: Site Details – Bituminous Concrete Sidewalk & Driveway Detail – Gravel base shall be 8”.* Also, bituminous concrete sidewalks shall consist of three (3) inches of bituminous concrete applied in a base two-inch layer and a top one-inch layer. Per regulations for sidewalks, “In all areas all materials shall be removed or filled to a depth of thirteen (13) inches below the finished design grade. In areas of high groundwater, as determined by soil borings, all materials shall be removed or filled to a depth of seventeen (17) inches below the finished design grade.” Add to detail.

Detail has been revised.

21. *Sheet C-24:* A vegetated area of at least four (4) feet in width shall be located between the sidewalk and the curbing, maintained in grass or retained natural vegetation, unless the Board approves an alternate sidewalk placement.

Applicant is requesting a waiver due to site constraints and stormwater design.

22. *Sheet C-27: Site Details – Typical Hydrant with Gate Detail Elevation View – 18” minimum should be 24” minimum.*

Detail has been revised.

23. *Sheet C-28: Site Details – Site Entrance Mat – Width of mat should be 24’ minimum instead of 20’ minimum.*

Detail has been revised.

24. *Sheet C-28: Site Details -* A landscaping plan prepared by a certified landscape architect should be provided.

Applicant is requesting a waiver to not have plan stamped by a landscape architect.

25. *Sheet C30: Site Details – Sidewalk Culvert Section – Sidewalk should be 3” bituminous and 8” gravel borrow.*

Detail has been revised.

26. *Sheet C30: Site Details – Rain Garden Typical Cross Section – Finish grade of rain garden is proposed to be mulch. Has stone been considered.*

The applicant has revised the detail eliminating mulch and installing river rock in its place.

27. *Site Details – Provide light detail.*

Applicant has responded that he will provide light details upon selection of make and model of light and poles.

28. *General – O & M Plan* How will snow removal/storage occur?

The applicant has added snow storage areas on plans and has revised the O&M Plan to address this further.

29. Sheet C31-The fire apparatus maneuvers appear to accommodate the fire apparatus throughout the roadway system. The applicant should also get confirmation from the Fire Department.
30. Provide detail of 12” stop bar location.
31. Sheet C24- Details are shown for “Grass Paver Access Road Detail” and “Emergency Access Gravel Road Detail”. I believe only the “Grass Paver Access Road Detail” applies to this project. Please confirm.

STORMWATER MANAGEMENT REPORT

The Stormwater Management Report has been revised. The applicant has not provided any responses to the comments below. Additional comments are indicated in bold below based on the revised design.

1. *Introduction*- The applicant does a good job with the Scope of Analysis, the Site Description, and the Proposed Construction description.
Revise last paragraph by adding “...dated 4/1/22, with a revision date of 11/10/22....”
2. *Hydrologic Analysis* – The information and analyses performed pertaining to this section are complete. The results of the analyses indicates no increase or a decrease in post peak rate runoff at all 8 analysis points for the 2, 10, 25 and 100-year, 24-hour storm event. Analysis provided is acceptable.
Although with the new analysis the Post-Development rates did increase during some storm events at the 8 analysis points, the post-development flows are still equal or less than the pre-development storm events. The analysis provided is acceptable.
3. *Stormwater Standards* - We are providing a list of each standard and supporting documentation for each for review.
 - *Standard No. 1: No new stormwater (e.g.) outfalls may discharge untreated stormwater directly to or cause erosion in wetlands or waters in Commonwealth.*

Met. The design includes stormwater discharges through water quality treatment BMPs prior to discharge. Riprap outfalls or perforated pipe level spreaders are used to reduce runoff rates to prevent erosion or sedimentation downstream.

Met. New design still meets Standard No. 1 as all discharges are treated and there is no outlets will create erosion or scour to any wetlands.

- *Standard No. 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*

Met. The proposed design indicates that there will be no increase to off-site peak flow rates and the rate of runoff will not increase the flood elevation downstream.

Met. New design still meets Standard No. 2.

- *Standard No. 3; Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type.*

Met. Recharge volumes through the use of raingardens and infiltration basins will provide ground water recharge that will far exceed the required recharge volumes.

Met. New design still meets Standard No. 3. Soil analysis, recharge volume calculations, infiltration sizing and infiltration at BMP's are accurately indicated.

- *Standard 4: Stormwater management systems shall be designed to remove 80% of the annual post-construction load of Total Suspended Solids (TSS). The Standard is met when:*
 - a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
 - b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
 - c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

Met: The applicant has provided data that indicates that with the proposed design greater than 80% of the annual post-construction load of TSS will be removed.

Met. New design still far exceeds the 80% of the post-construction load of TSS as no water quality flows bypass any rain gardens. The Long-term Pollution Prevention Plan is acceptable. The applicant has also provided supporting documentation for the treatment of water, recharging of stormwater and the attenuation of peak flows.

- *Standard 5: For land uses with higher pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses with the higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMP's determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, Sections 26-53 and the regulations promulgated thereunder at 314 CMR 3.0, 314 CMR 4.00 and 314 CMR 5.00.*

NA. Agreed this site is not a Land Use with High Potential Pollutant Loads.

Met. As previously noted the site is not a Land Use with High Potential Pollutant Loads.

- *Standard 6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to*

be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

Met. As noted and indicated, stormwater does discharge to or near critical areas consisting of vernal pools. All discharges from paved areas will be treated to a minimum 85% TSS removal and the discharges to or near the critical areas (vernal pools) are treated for 44% pretreatment prior to infiltration. Also with the treatment being provided, the applicant has demonstrated that the EPA Region 1 BMP Performance Extrapolation Tool and the Massachusetts Stormwater Handbook will provide for a minimum of 60% phosphorous removal as well.

Met. The redesign still provides specific stormwater best management practices for discharges.

- *Standard 7: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standards 2 & 3 and the pretreatment and structural best management practice requirements of Standard 4, 5 and 6. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

NA. Agreed that this is not a redevelopment project but the standards are being met.

Met. As previously stated the site is not a redevelopment project. However, standards 2, 3, 4, 5 and 6 are met.

- *Standard 8: A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

Met: An acceptable weekly inspection report form has been provided, and a construction period erosion and sediment control plan has been outlined on the site plans along with a sequence for implementation and construction phasing.

Met. New design still meets this standard. Note that the SWPPP will need to be submitted before any land disturbance.

- *Standard 9: A long-term Operation and Maintenance Plan shall be developed and implemented to ensure stormwater management systems function as designed.*

Met: An acceptable Operations and Maintenance Plan has been provided.

Met. As previously stated the Operations and Maintenance Plan provided is acceptable.

- *Standard 10: All illicit discharges to the stormwater management are prohibited.*

Met: The applicant has addressed that illicit discharges to the stormwater management system are prohibited in the Long-Term Operation and Maintenance Plan.

Met. New design addresses illicit discharges in the Long-Term Operation and Maintenance Plan.

The overall drainage design is complex. Several BMP's and the use of low-impact development has been incorporated into the design. Questions have been asked regarding the operations of the rain gardens particularly in the winter months. The applicant has provided several references to the effectiveness of rain gardens, bioretention areas and low-impact designs. The supporting documents have been included with the applicant's response to comments dated November 10, 2022 documentation regarding the effectiveness of bioretention areas in the colder months. Based on the information provided Pare concurs the implementation of these basins are acceptable.

Several revisions to the design have been made which appear to address the comments of the Conservation Commission. The raingardens have been designed to provide peak flow attenuation and address water quality and groundwater recharge.

The area of concern with infiltration not being provided and discharge is being directed towards the vernal pools, the design has been modified the rain gardens in cut slopes will be lined and will not provide recharge but the stormwater will pass through the soil media fro treatment and peak flow attenuation. Discharge to a pipe network will convey the treated water to a larger rain garden.

Pare is of the opinion that the submission and the Stormwater Management System has been designed to meet the requirements of the Stormwater Bylaws. Water quality has been addressed with the proposed design components. We have found the assumptions and analysis performed to be accurate and the components of the system have been sized appropriately for the proposed design.

We are available to discuss our initial comments at the next Board meetings. In the meantime, if you have any questions please feel free to contact me.

January 25, 2023

Rebecca Gendreau
Conservation Agent

Town of Sturbridge
301 Main Street, 1st Floor
Sturbridge, MA 01566

**RE: Response to DEP Comments
55+ Manufactured Housing Community – Justin Stelmok
Blueberry Hill Estates - Lot 3 Berry Farms Road, Sturbridge, MA**

Dear Conservation Members:

McClure Engineering, Inc. (McClure) is in receipt of the following comments from MassDEP date January 11, 2023, relating to “Blueberry Hill Estates” – Lot 3 Berry Farms Road, Sturbridge, MA. We are providing the following technical responses to each comment:

MassDEP Comments:

1. Identical depths to Seasonal High Groundwater (36") were observed at 28 separate Soil Test Pit locations. The applicant should verify that these unusually consistent observations are correct.

McClure Response: Soil test pits were observed and evaluated by Peter Engle, PE, a MassDEP Approved Soil Evaluator (SE14009). Estimated Seasonal High Groundwater was determined via the presence and/or absence of redoximorphic features and color mottling observed within the test pits. Per the article entitled “Soil Morphology as an Indicator of Seasonal High Water Tables”, prepared by Peter C. Fletcher of the USDA:

“Prolonged soil-saturation results in anaerobiosis leading to the formation of mobile ferrous iron. The migrating groundwater redistributes the iron throughout the soil profile. Subsequent drainage restores aerobic conditions, but some iron coatings on the minerals may have been entirely removed, leaving the grayish surface of the mineral grains exposed. During drainage, some areas around pores, cracks, and root channels become dry and aerated more quickly than the rest of the soil. Ferric iron precipitates in these places, forming reddish-brown spots. During periods of alternating wetting and drying cycles, such as seasonal high groundwater, ferrous iron does not transfer out of the soil profile entirely but moves over short distances only and precipitates during the drying phase. Such conditions are characterized by blotches of gray and reddish-brown soil colors occurring at the same depth. The longer the saturation period, the more pronounced the reduction process, and the grayer the soil becomes. This pattern of spots or blotches of different color or shades of color interspersed with the dominant color is called soil mottling.

The presence of low chroma colors covering over 5% of the surface area exposed in a soil pit marks the level of the mean seasonal groundwater elevation in most New England soils-the Estimated Average Seasonal High Water Table (EASHWT). Low chroma colors result from reduction / oxidation cycles occurring over many years (generally in terms of centuries), which makes this estimation method a reliable and conservative indicator of maximum seasonal groundwater elevation. Occasionally, the groundwater may be found at shallower soil depths, but there is no scientifically sound method to assess accurately this highest-ever level. If that interval is short, aerobic soil conditions persist; consequently, no low chroma colors are formed.”

The test pits performed were evaluated for these mottles and redoximorphic features. Determining the exact depth at which 5% mottling is found to be consistent is not an exact science, and should be considered approximate - the slight

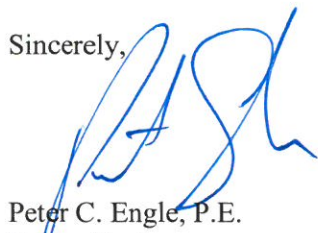
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difference in soil colors is not always easy to discern and is often slightly different from person to person. During the conducting of tests pits, there is also surface disturbance to the O and A soils horizons which also adds another layer of inaccuracy to the measurement of seasonal high groundwater from the ground surface. Due to the approximation associated with this method of determining seasonal high groundwater via soil test pits and mottling observation, Mr. Engle, tends to conservatively assume seasonal high groundwater at intervals of 6" (rounding down from the surface giving a shallower result). This approach adds a level of conservative protection in assuming a seasonal high groundwater level, and also simplifies in the design and construction of stormwater and sewage disposal systems (6" = 0.5'). In this case these 28 test pits all had evidence of mottling between 36" and 41" from the ground surface, and they were therefore all rounded to 36" and recorded.

McClure would also argue that this is not an unusual occurrence, for this site in particular. The entirety of the site, and location of all test pits, is located on the west sloping face of a common drumlin (streamlined hill composed of lodgment till molded by the flow of glaciers). This can be determined via the review of USGS Surficial Geology maps. This site is mapped as a mixture of thin and thick till over bedrock, which was observed on site through the soil test pits. USDA NRCS soil mapping also indicates that all the soils found on site are similar in consistency, with a parent material comprised of coarse loamy lodgment till, and in estimated depth to seasonal high groundwater, around 3', both of which were again observed on site. The observed soils and depths to groundwater are also consistent with the majority of soils found across the Sturbridge, Southbridge, and Charlton areas (outside of outwash plains located along rivers).

Please call me with any questions or comments at (508) 248-2005.

Sincerely,



Peter C. Engle, P.E.
Senior Engineer

Attachments

cc: John P. Shelvin, P.E., Pare Corporation, 10 Lincoln Road, Suite 210, Foxboro, MA 02035
Justin Stelmok,

Reduced Salt Application Plan

Purpose: Reducing salt application on the roadways will serve to protect the downgradient Wetland Resource Areas, including the on-site Vernal Pools. Blueberry Hill Estates will be designated a Reduced Salt Community.

The Town of Sturbridge Department of Works (DPW) typically applies salt at 250 lbs. per lane-mile. MassDOT has a standard salt application rate of 240 lbs. per lane-mile within reduced salt zones for the purpose of minimizing salt and chloride effects.

A reduced salt application by 25-50% (120-180± lbs. per lane-mile) of the MassDOT standard is targeted by Blueberry Hill Estates by implementing various Best Management Practices (BMPs).

The Reduced Salt Application Plan is based on MassDOT Highway Division information, including MassDOT's Reduced Salt Policy (April 1, 2014); New Hampshire Department of Environmental Services (NHDES) information, including NHDES' Best Management Practices and Salt Use Minimization Efforts in Chloride-Impaired Watersheds of New Hampshire (2020); and the National Pollutant Discharge Elimination System (NPDES) General Permit requirements for Stormwater Discharge from Small Municipal Separate Storm Sewer Systems in Massachusetts (MS4 Permit), more specifically, requirements of discharges to chloride-impaired waters.

Winter maintenance activities will be conducted by a community maintenance company with trained personnel on this Reduced Salt Application Plan and BMPs. The maintenance company shall monitor the weather forecast to make informed decisions as to when and to what extent materials are applied to the roadways.

Implemented BMPs to reduce the amount of salt applied in the short-term or possibly in the future may, include, but are not necessarily limited to the following:

- Pre-wetting agents (e.g., salt brine or liquid deicer) may be used on off-site salt stockpiles and/or within trucks to increase efficiency and reduce road salt scatter and bounce. The application of pre-wet salt can be decreased by approximately 20% over dry salt.
- De-icers, such as rock salt, liquid magnesium chloride, Pre-Mix (rock salt and calcium chloride), and/or trademarked alternatives (e.g., Magic Salt™/Treated Salt, Morton® Bulk Blizzard Wizzard®). The application rate of de-icers shall be adjusted based on the type of storm, type of agent used, and anti-icing and pre-wetting techniques used.
- Sand may be sparingly applied to increase traction at lower temperatures, but should be limited to avoid clogging up the drainage systems.
- If prudent, based on site conditions and observations, roadway surfaces may be proactively pre-treated with anti-icing agents, such as liquid brine, prior to weather events to prevent the formation of bonded snow and ice to the roadway surface.
- No snow storage within rain gardens or stormwater systems and/or the 24± acre Open Space.

- Regular calibration of spreading equipment and equipment/trucks washing (off-site). Typically, a 25% reduction in salt use can be achieved simply by calibrating equipment.
- Training for contractors engaged in winter maintenance activities as BMPs, technology, materials, etc., evolve. (Roadside signage is not proposed as plow truck operators will be trained specifically on salt reduction measures).
- Educational outreach to residents on community salt reduction measures and purpose.

This Reduced Salt Application Plan is intended to be adaptive based on monitoring, site conditions, learned-lessons, etc., while balancing public safety. Results from the Vernal Pool Monitoring Program, including water quality testing, may inform modifications to winter maintenance activities, including, but not necessarily limited to the products utilized, application rates, frequency, etc.

COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
STANDARD OPERATING PROCEDURES

S.O.P. NO.
HMD-01-01-1-000

PAGE 1 OF 16

SUBJECT: REDUCED SALT POLICY

Distribution: Statewide

EFFECTIVE

April 1, 2014

ISSUED

APPROVED



PURPOSE

To establish reduced salt zones for the purpose of minimizing sodium and chloride effects on an industrial or potable water supply. To clearly identify and delineate the limits of each reduced salt zone in each district, as well as identify the materials and application rates to be used.

RESPONSIBILITY

The District Highway Director (DHD) is directly responsible for maintaining this policy and ensuring that the procedures outlined are followed. The operation and maintenance of reduced salt zones requires increased material expenditures due to the use of calcium chloride, magnesium chloride and/ or salt-sand mixes, as well as the cost for increased supervision and sand disposal. All locations shall be closely supervised during all storm events. The District shall be responsible for ensuring that chemicals for the reduced salt zones are available, and that the maps are distributed in a timely manner to appropriate personnel including privatized forces for increased awareness.

NOTE: In order to maintain public safety and at the direction of the Highway Administrator or his designee, one or more applications of straight Salt, Pre-Mix or 50/50 may be applied at 240 lbs. per lane mile.

The Snow & Ice Materials Usage Committee (S&IMUC) shall make recommendations for the addition, deletion or modification of reduced salt zones. Reduced salt zones shall only be established based on scientific data as required by SOP, ENV-01-30-1-000. The failure of a municipality or public water supplier to provide the regular monitoring data as required by the aforementioned SOP to demonstrate the effectiveness of the reduced salt zone may be grounds for MassDOT to discontinue treating the corresponding section of highway as a reduced salt zone.

DEFINITIONS

Salt or Sodium Chloride is the primary deicer utilized by MassDOT due to its chemical deicing properties and cost effectiveness; at 24⁰-32⁰ F. Applied at 240 lbs per lane mile, salt is the most cost effective and best deicer available. It is a crystal that has to become a liquid or brine in order to work effectively. Salt transforms into brine with the addition of heat, moisture and time.

Pre-wetted Salt is sodium chloride sprayed with Liquid Magnesium Chloride or Blended Brine. The application rate is 8-10 gallons per ton of salt. Best utilized by spraying on salt from 30⁰ F and below, and on all applications of material. The act of pre-wetting serves several functions: it reduces bounce and scatter, and accelerates the salt going from a solid to solution or brine.

Pre-mix is a combination of Sodium Chloride and Flake Calcium Chloride (Solid). The ratio of the two products is 4:1, 80% Sodium Chloride and 20% Calcium Chloride. Pre-mix combined with sand is used in some of the reduced salt zones.

50/50 Mix is a 1:1 mixture of sand with a deicing material. The deicing material may be salt or pre-mix. This material is not the most effective deicer but is used in reduced salt zones to reduce sodium and chlorides into the environment. This mixture is sometimes used during sleet or freezing rain events.

Liquid Magnesium Chloride 30% a corrosion inhibited deicing agent. A blend of magnesium chloride 30% and an environmentally friendly (Amine) additive creating a blended chemical 70% less corrosive than conventional deicers. The eutectic temperature is about -28°F at a concentration of 21.6%. Its ice melting capacity is about 40% greater than CaCl₂. Utilized for Pre-treating of roads or Pre-wetting of all spread material.

Pre-treatment a proactive strategy designed to prevent a bond between the snow and ice and road surface. This is achieved by the direct application of liquid. The typical application rate is between 20-30 gallons per lane mile. Pre-treatment is normally done on pavement temperatures of between 15-30⁰F or 30⁰F and falling.

Blended Brine 23.3% salt to water is a cost effective deicing solution used as a blend with liquid MgCl (85% salt). It is applied at a rate of 40-50 gallons per lane mile and used for pre-wetting salt or direct application pre-treatment.

Sand A clean inert, hard material free of organic material with no melting capabilities. Sand is intended to increase friction between vehicles and the pavement. The sand is typically mixed with pre-mix on a 1:1 basis. Because of the environmental and economic impact, MassDOT restricts the use of sand in our operations to reduced salt zones and in extremely cold temperatures.

District I

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D1-01	Private	Becket	Route 8	Carter Road to Washington TL	2	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D1-02	Private	Cummington	Route 9	From the Dudley Manor Bridge & continuing to the westerly entrance to Cummington Village.	3.7	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D1-03	Private	Goshen	Route 9	From the intersection of Ball Road, continuing easterly to approximately 2,500 feet east of the Whale Inn.	6.2	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D1-03	Private	Goshen	Route 112	From the end of town road, northerly to the intersection with Maple Ave.	6.2	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

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District 2							
Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D2-01	Public	Erving	Route 2	From east end of the French King Bridge, easterly to approximately 200 feet prior to the Moore Street overpass.	3	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D2-02	Public	Erving	Route 63	From the intersection with Kennedy Road northerly to the intersection of Poplar Mountain Road.	3.4	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D2-03	Private	Granby	Route 202	From the Belchertown/Granby TL, westerly to the Granby/South Hadley TL.	17	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D2-03	Private	South Hadley	Route 202	From the Granby/South Hadley TL to the intersection with Route 33.	17	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D2-04	Private	Orange	Route 2	From approximately 250 feet east of the Orange/Wendell TL to the intersection with Route 202, including ramps.	14.5	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 2

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D2-05	Private	Belchertown	Route 9	From the Belchertown/Pelham TL, southerly, to the intersection of Route 202.	13.9	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D2-06	Private	Belchertown	Route 202	From the intersection of Route 202 & Route 9 northerly, to the Pelham TL.	15.2	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D2-06	Private	Pelham	Route 202	From the Belchertown TL northerly to Kings Road in Pelham.	15.2	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 3

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D3-01A	Public	Auburn	Route 12	From the Oxford TL to to the Worcester TL.	27.7	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D3-01B	Public	Oxford	Route 12	From the Oxford center of town northerly to the Auburn TL.	27.7	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D3-02	Public	Boylston	Route 70	From Shrewsbury TL to the Clinton TL.	18	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D3-02A	Public	Clinton	Route 70	From the Clinton/Boylston TL to the end of center of town in Clinton.	18	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D3-02	Public	Shrewsbury	Route 70	From the Worcester/Shrewsbury TL to the Shrewsbury/Boylston TL.	18	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D3-03	Private	Charlton	Route 20	From the intersection of Depot Road, westerly to the junction of Route 169.	6	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 3

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D3-04	Public	West Boylston	Route 12	From the intersection with Central Street, northerly to the summit of Balderellis Hill.	5.3	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D3-05	Private	West Boylston	Route 110	From the intersection with Route 12 to the Clinton TL.	12.4	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 4

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D4-01, A-B	Public	Lincoln	Route 2A	From Hanscomb Dr. in Lincoln to the Lexington TL.	1.63	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-01, A-B	Public	Lexington	Route 2A	From the Lincoln TL to the Arlington TL, including the 128/2A interchange.	15.05	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-01, A-B	Public	Arlington	Route 2A	From Lexington TL to Brattle Rd., Arlington.	7.63	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-02, A-B	Public	Lincoln	Route 2	From Bedford Rd. in Lincoln to Lexington TL.	7.11	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-02, A-B	Public	Lexington	Route 2	From Lincoln TL to Pleasant St. in Lexington (Exit 55), including the 128/2 interchange.	19.82	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-03, A-F	Public	Lexington Waltham	Route 128	From Route 4/225 (exit 31), to Route 20 (Exit 26), including all interchanges and all related ramps.	67.19	Salt	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 4

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D4-05 A-C	Public	Chelmsford	Route 3	From Route 129 (Exit 29) to Route 40 (Exit 33) including ramps and feeder lanes.	39	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-06	Public	Chelmsford	Route 3A Route 4	From the Chelmsford High School to the Chelmsford/Tyngsborough TL.	11.4	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-07	Public	Lowell Chelmsford	Lowell Connector	From Gorham Street to Route 3, including all ramps.	30.4	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-08	Public	Chelmsford Lowell	Route 110	From Fletcher Street, Chelmsford to Industrial Ave., Lowell.	6.5	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-09 A-C	Industrial	Lynnfield Peabody	Route 128	From Lowell Street, Peabody (Exit 26) to Salem Street, Lynnfield (Exit 42) and all related ramp systems.	63.2	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-10	Industrial	Lynnfield Peabody Lynn	Route 129	Route From our Lady of Assumption Church in Lynnfield to St Mary's Cemetery in Lynn.	8.2	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 4

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D4-11	Industrial	Peabody	Route 95	The long ramps connecting Route 95 to Route 128, beginning and ending approximately at the Forest Street overpass.	10.0	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-12	Industrial	Lynnfield Peabody	Route 1/95 Interchange	Route 1 interchange with Route 95 from the Route 1 Jughandle to and including Goodwin Circle.	13.4	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-13	Public	Andover	Route 93	From Dascomb Road, Tewksbury (Exit 42) to River Road, Andover (Exit 45).	38.8	Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-14	Public	Andover	Route 495	From Route 133 (Exit 39) to I-93 (Exit 40), including ramp systems.	19.6	Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D4-15, A-C	Private	Danvers Topsfield Middleton Boxford Rowley	Route 95	From the Ferncroft Rotary, Danvers (Exit 50) to Route 133, Georgetown (Exit 54).	45.6	Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid Magnesium Chloride	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid Magnesium Chloride	30 Gal/Ln Mile

District 5

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D5-01	Public	Avon	Harrison Blvd.	From Route 24 to Route 28.	16.8	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-01	Public	Avon	Route 28	From Randolph TL to Route 37.	16.8	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-02	Private	Freetown Lakeville Taunton	Route 140	From the junction of Chace Road, (Exit 8) in Freetown, northerly, to the intersection of Route 79 in Taunton (Exit 10).	38.6	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-03	Private	Freetown Lakeville Taunton	Route 18 & County Road (Old Route 140)	County Road (Old Route 140), starting @ the New Bedford/Freetown TL to Route 79 in Lakeville.	19.1	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-04	Public	Middleboro	Route 28	From the junction of Route 495 (Exit 3) to the junction of Route 44 rotary (Exit 6).	21.3	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-05	Public	Middleboro	Route 495	From the interchange of Route 28 to the interchange with Route 44.	43.9	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 5

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D5-06	Public	North Attleboro	Route 1	From the Attleboro/ North Attleboro TL northerly to the intersection of Route 120, Hoppin Hill Ave., in North Attleboro.	10	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-07	Public	Attleboro	Route 95	From Route 95 / 295 interchange (Exit 4) extending southerly to & including the Route 123 interchange (Exit 3), except for the ramp from Route 95 North Bound to Route 123 East Bound & the ramp from Route 123 West Bound to Route 95 North Bound.	14.7	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-08	Public	North Attleboro	Route 295	From and including the interchange @ Route 1 (Exit 1) northerly to Route 95 (Exit 2), including the ramp from Route 295 NB to Route 95 SB and the ramp from Route 95 NB to Route 295 SB.	18.6	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 5

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D5-09, A-B	Public & Private	Bourne Sandwich Barnstable Dennis Harwich Brewster Orleans Eastham Wellfleet Truro Provincetown	Route 6	From Sagamore Bridge, Route 6 in Bourne to Province Land Road, Provincetown.	277.9	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-10, A-C	Public & Private	Falmouth Bourne	Route 28 (Palmer Ave.)	From the Cape Cod Canal to the end of the State Highway in Falmouth.	97	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-11	Public	Falmouth	Wood's Hole Road	From the intersection of North Main Street & Route 28 (Palmer Avenue) to Water Street in Falmouth.	14.5	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 5

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D5-12	Public	Harwich Dennis Yarmouth Barnstable	Route 28	From the junction of Route 132 and Route 28 in Barnstable to the Harwich / Chatham TL.	43.2	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-13, A-B	Public	Barnstable Mashpee Falmouth	Route 28	From Falmouth Heights Circle in Falmouth to the junction of Route 28 and Route 132 in Barnstable.	45.08	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-14	Private	Chatam Harwich Orleans	Route 28	From the Harwich / Chatham TL to the Orleans Rotary.	31.7	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-15	Public	Falmouth Bourne	Route 28A	From the junction of Route 28 (McArthur Blvd.) and Roberta Ave. in Bourne to the junction of Sippewisset Road and Palmer Ave. in Falmouth.	15.8	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-16	Public	Barnstable Yarmouth Dennis Brewster Orleans	Route 6A	From the junction of Route 6A and Hyannis Road in Barnstable to the junction of Route 6A and Route 28 (Orleans-Chatham Rd.) in Orleans.	45.1	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-17	Public	Barnstable Sandwich Bourne	Route 6A	From Bourne, at the State Police rotary, to the junction of Route 6A and Old Jail Lane in Barnstable.	37.5	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 5

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D5-18	Public	Sandwich	Route 130	From the intersection of Route 6A to approximately 100 feet east of Tupper Road & from the intersection of Shawme Road to 1,000 feet north of Jan Sebastian Way.	8.8	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-19	Public	Barnstable	Route 132	From the junction of Route 6A and Route 132 to Bearses' Way.	4.1	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-20	Public	Wareham Plymouth Bourne	Route 25	From Exit 1, to approximately 2,100 feet west of the Bourne Bridge.	58.4	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D5-21 , A-E	Public & Private	Martha's Vineyard	Various	State Road (South Road)	101.4	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
				West Tisbury Road			
				Upper Main Street in Edgartown			
				Seaview Avenue		Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended	8-10 Gal/Ln Mile
				Beach Road			
				New York Avenue			
				Temahigan Avenue			
				Eastville Avenue			
State Road (North Road)	Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile					
West Basin Road							
D5-22	Public & Private	North Truro Provincetown	6A	From the junction of Priest Road, and South Hollow Road in North Truro to the junction of Route 6 and Snail Road in Provincetown.	22.31	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

District 6

Map #	Type of Water Supply	Town	Route	Boundaries	Lane Miles	Materials	Application Rate
D6-01	Public	Weston	Route 128	From Route 20 (exit 26) to Route 9 (exit 20), including all related interchanges and all related ramps.	80	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile
D6-02	Public	Weston Waltham	Route 20	From the Wayland/Weston TL to Eddy Street, Waltham, including the 128/20 rotary and ramps.	14.52	Pre-Mix and/or Salt : Sand (1:1)	240 lbs/Ln Mile
						Pre-Wet w/ Liquid CaCl, Liquid MgCl or Blended Brine	8-10 Gal/Ln Mile
						Pre-Treat w/ Liquid CaCl, Liquid MgCl or Blended Brine	30 Gal/Ln Mile

ENVIRONMENTAL Fact Sheet



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WMB-26

2020

Best Management Practices and Salt Use Minimization Efforts In Chloride-Impaired Watersheds of New Hampshire A Guidance Document for Private Developers and Contractors

Scientific studies in southern New Hampshire have determined that over 40 streams have elevated levels of chloride high enough to be harmful to aquatic life, such as fish. Elevated levels can also be a drinking water health concern for people and animals, can lead to plant death particularly along roadsides, and can cause damage to infrastructure and automobiles. The primary source of these chlorides is salt used for winter snow and ice management. The New Hampshire Department of Environmental Services (NHDES) calculated that a salt use reduction of 25 percent to 45 percent was needed in order to meet water quality standards. The studies have also revealed that up to 50 percent of the chloride load was coming from parking lots, driveways and private roads from salt that is used for de-icing.

NHDES encourages private developers and contractors, particularly those working within chloride-impaired watersheds, to adopt best management practices (BMPs) and salt use reduction methods that will help improve water quality. NHDES also encourages private developers and contractors to consider winter maintenance during project design. Salt use reduction can lead to long-term cost-savings as a result of purchasing less salt and reduced impacts on vegetation (e.g., landscaping) and corrosion of infrastructure and vehicles. This guidance document is directed toward developers and contractors to help them reduce the use of salt, to plan for BMPs and salt reduction methods, to include design considerations relative to snow and ice management BMPs, and to document their snow and ice management plans. Taken together, these are the basic elements of a Salt Minimization Plan.

A REDUCTION IN SALT USE DOES NOT MEAN A REDUCTION IN SAFETY

Liability for damage or personal injury as a result of snow or ice is one of the main reasons that over-salting occurs and many contractors are reluctant to implement salt reduction practices for fear of increased liability. However, recent studies have found there are BMPs that can be used that optimize salt use, reduce the application frequency and amounts applied and, at the same time, achieve safe levels of service. In addition, commercial salt applicators certified by NHDES under RSA 489-C (Green SnowPro Program) and the property owners or managers who hire them are granted limited liability protection against damages and personal injury arising from snow and ice conditions.

WHAT DOES ALL THIS MEAN FOR PRIVATE DEVELOPERS AND CONTRACTORS?

Salt Minimization Plans for chloride reduction have been developed for a number of places in New Hampshire. Some of these plans are required by permits or other regulatory requirements. The New Hampshire Department of Transportation (NHDOT), towns, and private contractors who maintain parking lots, sidewalks, and roadways will be required to follow the Salt Minimization Plans through certain federal and state permits. In other places, watershed-wide Salt Minimization Plans have not yet been developed. In those areas, especially places that drain to chloride impaired waters, mandates to minimize salt usage are likely to be required of many new commercial and residential developments. Even in places with Salt Minimization Plans, the need to reduce salt may be so extreme that it will require the concerted efforts of the state, municipalities and private landowners to restore water quality.

THE ANNUAL NEW HAMPSHIRE SALT SYMPOSIUM

Every year, NHDES hosts an annual Salt Symposium. Attendees are updated with the latest snow industry technologies and BMPs. The event satisfies the required two-year refresher course for Certified Green SnowPro Applicators and UNH T2 Roads Scholar Program Contact Hours. To learn more about the event please visit:

<http://www.sima.org/new-hampshire-salt-symposium>.

HOW CAN PRIVATE DEVELOPERS AND CONTRACTORS MINIMIZE SALT LOADING IN CHLORIDE-IMPAIRED WATERSHEDS?

Some of the most effective ways for private developers and contractors to reduce their chloride loading in a watershed are to learn more about snow and ice management BMPs, learn ways to be more effective at winter maintenance activities, and to apply what is learned to current practices and future projects. There are three important ways for that to happen.

- **GET TRAINED AS A GREEN SNOWPRO**

There are several options available for getting trained as a Green SnowPro snow and ice management professional in New Hampshire. Green SnowPro training courses focus on efficient, more environmentally friendly winter maintenance practices that do not compromise road, parking lot and sidewalk safety. The courses cover the basics of salt reduction methods including equipment calibration and rate applications, pre-treatment methods, effective plowing and planning, salt accounting management and the environmental impacts of salting. The courses are offered several times a year at various locations throughout New Hampshire or online. For more information, search the NHDES webpage for Salt Reduction Program.

- **BECOME A NEW HAMPSHIRE CERTIFIED SALT APPLICATOR**

Individuals who complete the Green SnowPro Training (Full Course) and pass the exam are eligible to apply for voluntary NHDES Salt Applicator Certification. The NHDES Salt Applicator Certification program (Green SnowPro) aims to improve efficiency in salt use and reduce the amount of salt used by commercial applicators. The NHDES Salt Applicator Certificate carries the responsibility of annually reporting salt use to NHDES, renewing the certification each summer, and attending a refresher training course every two years. The Salt Applicator Certificate has proven valuable to private contractors as well as to their clients and their insurance carriers. To date, over 1,500 individuals have become Certified Salt Applicators. For more information on how to become a New Hampshire Certified Salt Applicator or to find a list of Certified Salt Applicators search the NHDES website for "NH Voluntary Salt Applicator Certification & Liability Protection."

- **DEVELOP A SALT MINIMIZATION PLAN(s)**

NHDES encourages developers and contractors to develop a Salt Minimization Plan as part of, or in addition to, their Winter Maintenance Plan or Winter Snow and Ice Control Policy to help reduce and manage the use of salt. Also referred to as Chloride Reduction Plans or Salt Reduction Plans, these plans vary from large, metropolitan city plans to single development plans. Where they exist, the plan should align with the objectives outlined in the town's or watershed's chloride reduction implementation plan. A general outline and description of what information goes into a Salt Minimization Plan is included as an attachment to this guidance document.

OTHER WAYS TO REDUCE SALT LOADING IN CHLORIDE IMPAIRED WATERSHEDS

(See Attachment B for a checklist of smart salting practices.)

- Be aware. Find out what the chloride loading reduction goals are within the watershed and town where work generally occurs or where the specific project is located.
- Re-evaluate current practices. Source reduction is identified as the most effective method for reducing chloride loading.
- Consider alternative de-icing materials such as calcium magnesium acetate (CMA) and limited use of abrasives (sand, sawdust, cat litter).
- Pre-wet salt with brine to reduce the loss of salt from bounce and scatter (up to a 30% reduction in loss) and increase melting times.
- Be proactive for storm events and anti-ice by applying a small amount of liquid chemical to pavements and overpasses *before* a storm to prevent ice from bonding with the surface.
- If applicable, keep pavement free of potholes and cracks which increase the ability for water to pond causing more ice to form. In addition, pavement that is in good condition allows for snow and or ice to be mechanically removed much more easily.
- Consider future maintenance needs in project planning.
 - Include development amenities/features such as heated sidewalks or parking garages.
 - Limit the amount of impervious surfaces that require winter maintenance activities. Some options to achieve this are only including sidewalks on one side of the street, the use of porous paving materials and limited use of curb cuts.
 - Design parking lots or designated parking areas with appropriate winter maintenance and snow storage practices in mind. This includes considering where plowed snow will be piled and avoiding melt drainage to flow back across cleared areas (freeze/thaw cycle).
 - Consider landscape vegetation that is more salt tolerant and that doesn't shade out sidewalks or parking areas from the sun during the winter.
- Share information with the municipalities and other landowners in the watershed to help track where salt is being applied, what quantities, and how often or the level of service based on the winter management plan. Track what BMPs are being applied to help determine effectiveness.
- Spread the word and encourage co-workers and colleagues to become a New Hampshire Certified Green SnowPro. Educate clients about the benefits of hiring a New Hampshire Certified Green SnowPro. The NHDES has developed a flyer for businesses to share with their colleagues

or clients relative to the Green SnowPro Program and it can be found by following the link below.

- Attend the annual New Hampshire Salt Symposium. The event satisfies the two-year Refresher Course requirement of the Green SnowPro Program.

OTHER RESOURCES AND REFERENCES:

For the complete list of NHDES resources including links to training and certification application materials available, please visit the NHDES Road Salt Reduction webpage.

[Assessing the Efficacy of Current Road Salt Management Programs](#), University of Waterloo (2010)

[Environment and Climate Change Canada](#) – technical documents, BMPs and general information.

[NHDES Green SnowPro Business Flyer](#)

[Pre-wetting and Anti-icing – Techniques for Winter Road Maintenance, a Wisconsin Transportation Bulletin - No. 22.](#)

[NH Salt Reduction Best Management Practices](#) (several Fact Sheet links available)

[Snow and Ice Management for the Business Owner – Clean Water and Safe Parking Lots](#), NHDES (2020)

[Snow Disposal Guidelines](#), NHDES (2020)

[Road Salt and Water Quality](#), NHDES (2020)

[Winter Parking Lot and Sidewalk Maintenance Manual](#), Minnesota Pollution Control Agency (2015)

ATTACHMENT A - DEVELOPING A SALT MINIMIZATION PLAN

Developing a Salt Minimization Plan will go a long way towards reducing salt use, i.e., chloride loading, within the watershed. The development of this plan will help private developers and contractors to hone in on how much salt is needed, when it should be applied, where it needs to be applied, etc. with the ultimate goal of reducing salt use without compromising safety. Salt use reduction also leads to long-term cost-savings as a result of purchasing less salt and reduced impacts on vegetation (e.g., landscaping) and corrosion of infrastructure and vehicles, and a reduction in well replacements. Reduction in the use of salt does not mean a reduction in level of service or public safety; in fact, many contractors who complete the Green SnowPro training course, pass the exam, and become a certified salt applicator have been able to provide the same level of service while reducing their salt use by 30%.

It is important to anticipate that a Salt Minimization Plan will be a living document that will likely need to be updated at some point. Reduction goals may fluctuate from year to year due to improvements in technology and BMPs, a municipality's requirements, or state and federal permit conditions that require private developers or contractors to alter practices, particularly as more development occurs. It is good practice to review and update the plan(s) annually, early in advance of the winter season so that there is time to make any necessary adjustments.

In general, NHDES recommends that the plan include:

- **Introduction/Background** – Identify the purpose and need for the plan. This section should describe any current chloride impairments and salt reduction goals within the watershed and municipality. If there is a Winter Maintenance Plan or Winter Snow and Ice Control Policy already in place, this section should briefly describe how this Salt Minimization Plan fits in with the more general winter maintenance approach and BMP practices. It may be that many of the items below are already adequately covered in the broader Winter Maintenance Plan.
- **Development or Project Area Description** – Describe the development. How many linear feet of roadways or sidewalks are there? Discuss the main features and layout of the site including stormwater runoff /topography, as well as vegetation and shaded areas. Including a general map of the development that identifies these features is helpful.
- **Operational Guidelines** – Identify who the responsible party is for winter maintenance activities and list out contracting requirements and minimum specifications for de-icing, anti-icing, pretreatment practices, and equipment. This guideline should describe the level of service required by the development which directly impacts maintenance operation plans.
 - **Winter Operator Certification Requirements** – This section outlines employee or contractor training and certification requirements relative to winter snow and ice management of the property (Green SnowPro training and certification is recommended).
 - **Weather Monitoring** – Outline where weather information will be acquired and how it is used to ensure that winter operators are making informed decisions as to when and to what extent materials are applied to private roadways, sidewalks and parking lots. An important part of this will be developing a good communication plan that identifies key personnel responsible for weather monitoring.
 - **Equipment Calibration Requirements** – Outline all winter equipment calibration requirements. Typically, a 25% reduction in salt use can be achieved simply by calibrating equipment, and is the single most important aspect to achieving salt use reductions.

- **Mechanical Removal** – Describe mechanical removal practices such as where snow should be stored and how often plowing should occur. Include goals, such as practices that minimize snow- and ice-pack to reduce the need for abrasives, salt and or brine applicants.
- **Salt Usage Evaluation and Monitoring** – Describe how salt usage will be documented and how salt use will be monitored and evaluated in conjunction with the municipality’s or watershed organization’s salt reduction plan (if applicable). Monitoring salt usage as well as winter maintenance actions are keys to determining what works, how much salt and other winter maintenance materials were used and estimating what is needed for the next winter season, and if salt minimization plan goals contributed to chloride load reductions in the watershed. It is recommended that a report be developed annually following the winter season and provided to the municipality in which the development or work is occurring for use in documenting private contractor salt use and allocations in the watershed. A schedule for how often the Salt Minimization Plan is updated should be included and tracked within this section as well.
- **Analysis of Alternative De-icing Materials, Site Design Considerations and Watershed Offsets** – Describe alternative de-icing materials (calcium magnesium acetate, e.g.) that could be used for winter maintenance activities, and discuss what was considered, incorporated, and/or eliminated and why. Discuss what site design features or amenities were incorporated or considered, such as parking garages, heated sidewalks, vegetation, etc., to minimize salt use. Include a discussion on other options for offsets within the watershed such as educating others and applying good salt application strategies to other facilities.

Salt Evaluation and Monitoring Elements:

- ✓ Where the maintenance is occurring.
- ✓ What the activity being performed is and/or what equipment is being used.
- ✓ What the weather conditions are - include:
 - Event timing (pre-storm, during, post-weather event)
 - Air and ground temperatures
- ✓ Time of activity
- ✓ Application rates
- ✓ Results
- ✓ Other info – BMPs in practice for consideration, etc.

Not all items above need to be included within the plan, generally the more complex the project, the more detailed the plan. In addition, some of these items may already be thoroughly covered in the broader Winter Maintenance Plan.

ATTACHMENT B – SMART SALTING PRACTICES

A checklist for snow and ice management contractors.

Recommended practice	Check which response applies to current practices and anticipated site maintenance activities for the job site.				
	Already do	Will do	Might do	Will not do	If "will not do"....why not?
Use of a salt application rate chart.					
Calibrate equipment each year.					
Learn about the de-icer ingredients and use the appropriate one for the condition.					
Look for reasons if and why materials are leaking or spilling from vehicles and repair them (e.g. gaps, overfilling, etc).					
Develop a comprehensive winter maintenance policy. Follow your policy.					
Measure and use pavement temperatures.					
Use anti-icing appropriately prior to the storm.					
Plow before applying de-icers.					
Use wet materials (pre-wet or pre-treated).					
Don't apply sodium chloride (road salt) for pavement temperatures below 15°F.					
Don't apply de-icers for pavement temps under -10° F. It's too cold.					
Separate salt and sand. Use salt for melting. Use sand for traction.					
Apply de-icers in the center of the road or on the high side of the curve.					
Store the salt in a building or under secure cover.					
Store salt away from water flow and direct the water away from storage area.					
Store snow away from lakes, ponds and wetlands.					
Sweep up sand, dispose of properly.					
For each event, document what you did and how well it worked. Use this information to make improvements.					

Checklist is adapted from worksheet created by Fortin Consulting as a part of the Minnesota Pollution Control Agency Smart Salting Voluntary Certification Program.



Vernal Pool Monitoring Program

Purpose: The southerly and northerly A-series Vernal Pools and on-site portion of the E-series Vernal Pool will be monitored to assess the biological activity and water quality of the three Vernal Pools over a five-year time period, including pre, during, and post-phased construction of Blueberry Hill Estates.

The following reviews the proposed monitoring schedule based on the anticipated project schedule, biological assessment, water quality testing, and reporting.

Monitoring Schedule

Pre-Construction Vernal Pool monitoring will take place in 2023 (Year 1). To date, LEC has documented the biological activity within the three Vernal Pools in 2021 and 2022, thus providing supplemental pre-construction monitoring (baseline).

During and Post-Phased Construction Vernal Pool monitoring will take place in 2024-2027 (Years 2-5). Project phasing is depicted on Sheet C19 (*Phasing Plan*) of the plan set (*Special Permit and Site Plan, Blueberry Hill Estates, 55+ Manufactured Housing Community, Lot 3 Berry Farms Road, Sturbridge, MA*, prepared by McClure Engineering, Inc., last revised on November 10, 2022); however, subject to change. Based on work commencement by Summer 2023, Phase 1A (Lots 1-4 & 69-71) is intended to be completed in 2024 (roadway constructed, stormwater management installed, and homes occupied). Phase 1B (Lots 6-13 & 60-66) is scheduled to be completed in 2025-2026 and Phase 2 (Lots 14-25 and clubhouse/amenities) is intended to be completed in 2026-2027.

Biological Assessment

Vernal Pool Biological Assessments will be conducted implementing scientifically accepted professional practices and standards in accordance with the *Massachusetts Division of Fisheries and Wildlife Guidelines for Certification of Vernal Pool Habitat* (March 2009, "NHESP Certification Guidelines"). Specifically, LEC will document the presence or absence of Obligate Vernal Pool Species and breeding activity, including Fairy Shrimp via visual observation and dip-netting, and Obligate or Facultative Vernal Pool amphibian breeding activity (e.g., spermatophores, chorusing, mated pairs, egg masses, transforming tadpoles/larvae/juveniles, etc.). The number of egg masses observed will be recorded each year.

The Assessments will commence each year concurrently with the commencement of regional amphibian breeding activity, more specifically amphibian migration to vernal pools following snow/ice melt and favorable weather conditions (precipitation/temperature).

At least two (2) site evaluations will be conducted each year; however, additional site visits may be warranted based on weather conditions, hydrology, or Vernal Pool breeding activity.



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Blueberry Hill Estates
Sturbridge, MA
2/6/23

Water Quality Testing

LEC will conduct water quality testing during the first week of April in Years 1-5 or immediately following ice melt.

Water samples will be collected from each Vernal Pool for laboratory testing for the following: turbidity, dissolved oxygen, pH, nitrogen, phosphorous, calcium, chloride, magnesium, and sodium.

In conjunction with water quality testing, LEC will also document water temperature and water levels within the deepest portion of the pools.

Reporting

LEC will submit annual monitoring reports to the Sturbridge Conservation Commission no later than July 1st of each year. The monitoring reports will detail the biological assessment and water quality testing findings along with photo documentation, water depths, and temperature.