

# Gravel Road Design & Maintenance Plan

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*Wildewood Estates*

*Rome, Maine*

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## **INTRODUCTION**

Wildewood Estates and the adjoining network of roads that make up the Association are not unlike many other unpaved, gravel roads in Maine. The major issues on the road are numerous shoulder berms that do not allow water to get off the driving surface and insufficient surface material and shaping. When water is not reaching the ditches and getting away from the driving surface, rutting and potholing during mud season is common. If the driving surface is flat potholes can occur at any time of year. Since water cannot always get away from the shoulders, erosion is occurring on hills.

Overall, portions of the road are in good condition and the design and past road maintenance work has been successful. Addressing the worst sections with additional surface material and ditching and maintaining the better sections will provide advantages to those who drive the road as well a cost savings to those who must maintain the infrastructure.

This management plan will address the road in sections and give recommendations for work sequence as well as how to address the various sections that need attention. Rankings are based on three factors:

- 1) Spending money on the worst sections of the road first to produce future savings
- 2) Protecting financial investments already made in the road and
- 3) The site's impact on the surrounding watershed

### **Existing Condition**

The surface of the Wildewood Estates road network consists of bluestone gravel that has been used in many sections as well as sections with 1" and ¾" minus gravel. There is also one section that has been paved. In most locations along the road, the road base is providing sufficient elevation above the surrounding grade and ditching has been completed in correct locations. The majority of the problems that exist within Wildewood Estates are from water not reaching the ditches and a lack of sufficient surface crown. Several culverts carry water under the road network and vary in condition from good to poor.

## **MATERIALS**

### **Road Base**

Ideally, all gravel roads would be constructed using proper methods and materials. The reality of gravel roads in Maine is something very different since most of our roads began as logging roads or horse paths. When building a new road, once a thin, level base has been established where the road will be built, a layer of woven geotextile fabric is installed. Fabric provides separation between groundwater and the road materials. Installed over the fabric is the road base material which should be a minimum of 12" (compacted depth) of a 4" minus gravel that is compacted in

6" lifts meaning that material is rolled each time 6" of material is put down until the desired depth is obtained.

### **Surface Materials**

If gravel is to be used for surface material, it should be a  $\frac{3}{4}$ " – 1.5" minus gravel with 7-12% fines. A  $\frac{3}{4}$  - 1" minus material is preferred for most gravel roads but gravel aggregate sizes vary by region so anything available within the range is acceptable. Surface material should also be properly shaped so water can drain away from the driving surface and rolled with the same vibratory compactor used for compacting the base material. Keep in mind that crushed gravel packs significantly better and maintains a better driving surface than round or bank-run gravel.

Bluestone gravel is another surface material option. Bluestone is a bit more expensive than regular gravel but in certain situations or sections of a road it will be the best option. Bluestone is made using a crusher to produce the proper aggregate size and the stone dust from the crushing process is used for the fine material. The angular nature of a product produced this way delivers a gravel that packs extremely tightly forming a very hard driving surface. Once installed, bluestone can and should be graded regularly, just like regular gravel, to maintain proper road surface shape.

Another popular surface material used on gravel roads and driveways is recycled asphalt or reclaim.  $\frac{3}{4}$ " minus is the most common size of recycled asphalt which utilizes a mixture of recycled road and driveway surface asphalt, crushed rocks, and sand which have all passed through a  $\frac{3}{4}$ " square screen. It packs well when rolled and can be graded to maintain surface shape but is not something I recommend anymore. Bluestone has proven to hold up better, pack more firmly and perform better overall on the trouble spots.

In most situations a good, crushed  $\frac{3}{4}$ " - 1" minus gravel with 7-12% fine material is a sufficient surface material however some sections of road may require different materials. Some sites in the Photo Descriptions may specify the use of bluestone or other materials to address a chronic erosion site. Crushed gravel will pack nearly as well as bluestone and better than common "bank run".

Surface gravel compacts to approximately  $\frac{1}{2}$  the installed depth so if 12" of pre-compacted gravel is added to a road it will compact to approximately 6".

### **Maintenance**

In order to protect the investments made in Wildewood Estates, the surface should be graded annually to maintain the crown. Special attention should be paid to keeping grader berms raked out so water can get off the road shoulders and into the ditches or woods. It is likely that Wildewood has become wider over the years as graded and plowed materials end up in the

ditches. As the driving surface of gravel roads becomes wider, ditches are pushed further away and toward the boundaries of the right of way. As ditches are cleaned in the future, care should be taken so that they do not migrate away from the road center.

Any ditches, culverts and plunge pools should be kept free of obstructions like tree branches and sediment build up so they can function properly.

### **Dust Control**

Controlling dust on gravel roads provides two important benefits for road owners and users. First, if the road is situated near a water body, blowing dust can cause a host of problems for the lake, river, or stream leading to a decline in water quality. Second, wind erosion or dust created from vehicle traffic means the investments made in the road are being lost each time the wind blows as fine material from the gravel disappears.

The two most common ways of controlling dust on gravel road are using Calcium Chloride or Lignin Sulfonate. Calcium Chloride works by absorbing water from the air, adding moisture and further tightening the compacted surface of the road. Calcium Chloride is slightly corrosive to steel and highly corrosive to aluminum so vehicle corrosion can be a concern. This product is generally applied in either a flake or liquid form. Lignin Sulfonate acts as a binder for road surface gravel and is a by-product of the wood pulp digestion process. Lignin is a natural cement that binds wood fibers together. It must be worked into the top 1-2" of the road surface usually by a grader or rake and should be the "processed" type and not the unprocessed lignin which is very sticky and odorous. This product comes in a powder form and is applied using the same methods as Chlorides.

### **EVALUATION OF WILDEWOOD ESTATES**

Road is used **year round and plowed** in the winter

**Telephone numbers:** Trisha Cheney: 207-215-1706, Irving Felker: 207-846-4669

**Name of Evaluator:** Josh Platt, President, Maine Environmental Solutions LLC

**Date of Evaluation:** October 27 & November 5, 2017

**Weather conditions:** 50 degrees and sunny

## Site # 1



**Site # 1:** Beginning of Wildewood Estates, 558' to end of new bluestone section beyond Pole # 3.

**Issues:** Site has good elevation above surrounding grades, some minor potholes and shoulder berms beginning to form

**Fix:** Cut potholes and maintain crown at  $\frac{1}{2}$ " per foot with regular grading.

**Priority #: Maintenance**

## Site # 2



**Site # 2:** End of Site # 1- 176' to Duggan driveway

**Issues:** Lack of sufficient surface crown causing rutting of shoulders. Shoulder berms

**Fix:** Shave shoulder berms and install 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to  $\frac{1}{2}$ " per foot crown.

**Priority #: 4**



### Site # 3



**Site # 3:** End of Duggan driveway – 887' to pavement on hill,

**Issues:** Insufficient surface crown, rutting, lack of ditching on left side to driveway culvert, ledge present. Left side ditch full of existing surface material (bluestone)

**Fix:** Define ditching on left to driveway culvert to greatest extent possible. Install 8" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to ½" per foot crown.

**Priority #:**1



## Site # 4



**Site # 4:** Paved section of road

**Issues:** Pavement cracking but drainage is good

**Fix:** None needed

## Site # 5



**Site # 5:** End of pavement – 247' to Cedar Estates

**Issue:** Lack of sufficient surface material to shed water off driving surface, shoulder berms

**Fix:** Install 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to 1/2" per foot crown.

**Priority #:**3



## Site # 6



**Site # 6:** Beyond Pole # 13 – Cedar Estates – 400' to Pole # 14.5

**Issues:** Shoulder berms inhibiting drainage off surface, lack of surface crown

**Fix:** Shave shoulder berms and install 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to  $\frac{1}{2}$ " per foot crown.

**Priority #: 5**

## Site # 7



**Site #7:** Curve at Pole # 14.5 down - hill – 1467' to Pole # 19

**Issues:** New bluestone rutting on hill shoulders

**Fix:** Using existing surface material, grade to shape  $\frac{1}{2}$ " per foot crown. Add surface material as needed.

**Priority #: 2**

## Site # 8



**Site # 8:** Pole # 19 (Intersection on Balsam) 492' to Driveway # 171

**Issues:** Lack of sufficient surface material to shed water off driving surface.

**Fix:** Install 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to ½" per foot crown.

**Priority #:** 7

## Site # 9



**Site # 9:** Driveway # 171 – 900' to Byrne driveway (#204)

**Issues:** Middle to end sections lack crown.

**Fix:** Maintain crown in beginning section and add 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to ½" per foot crown on remainder

**Priority #:** 8



## Site # 10



**Site # 10:** Driveway # 204 – 440' to Driveway # 225 (Cardinali)

**Issues:** Surface is flat and lacks sufficient surface crown

**Fix:** Add 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to  $\frac{1}{2}$ " per foot crown on remainder

**Priority #:** 10

## Site # 11



**Site # 11:** Driveway # 225 – 991' to Driveway # 90

**Issues:** New bluestone in this section with older bluestone material on hill

**Fix:** Maintain crown at  $\frac{1}{2}$ " per foot with regular grading.

**Priority #:** Maintenance

## Site # 12



**Site # 12:** Driveway # 90 – 1123' to Pole # 8

**Issues:** Surface is flat and lacks sufficient surface crown, some potholes forming, ledge is present

**Fix:** Add 4" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to 1/2" per foot crown on remainder

**Priority #:** 11

## Site # 13



**Site # 13:** Pole # 8 – 482' to Spruce/Aspen intersection.

**Issues:** Shoulder berms present preventing water from getting off road surface and shoulders causing potholes. Surface material needs shaping.

**Fix:** Shave shoulder berms, cut potholes and reshape crown so water drains off surface and shoulders.

**Priority #:** 6



## Site # 14



**Site # 14:** Beginning of Aspen – 555' to intersection with Wildewood

**Issues:** Site is in good condition with sufficient bluestone and crown

**Fix:** Maintain crown at  $\frac{1}{2}$ " per foot with regular grading.

**Priority #: Maintenance**

## Birch Estates

### Site # 1



**Site # 1:** Beginning of Birch -629' to end of new gravel section

**Issues:** Site is in good condition with sufficient 1" minus gravel and crown. Existing 18" metal culvert at 424' has failed.

**Fix:** Replace existing culvert with 18" HDPE culvert and maintain crown at  $\frac{1}{2}$ " per foot with regular grading.

**Priority #:** Culvert - 1

**Surface - Maintenance**





## Site # 2



**Site # 2:** Bottom of hill – end of Site # 1 – 900' to Pole # 3.1 at end of road.

**Issues:** Lack of surface crown, rutting, shoulder berms

**Fix:** On hill - Add 12" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to  $\frac{1}{2}$ " per foot crown. Install 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to  $\frac{1}{2}$ " per foot crown on remainder of road

**Priority #: 2**

## Spruce Estates



**Issues:** Lack of surface crown, rutting, on hills, shoulder berms

**Fix:** Shave shoulder berms and install 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to  $\frac{1}{2}$ " per foot crown.

## Hemlock Estates



**Issues:** Lack of surface crown, rutting, significant shoulder berms

**Fix:** Shave /remove shoulder berms and install 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to  $\frac{1}{2}$ " per foot crown.

## Balsam Estates



**Issues:** Lack of surface crown in beginning. Remainder of road has had recent work done and is in good condition with new culverts and crown.

**Fix:** Install 6" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to  $\frac{1}{2}$ " per foot crown along beginning section. Maintain remainder with  $\frac{1}{2}$  per foot crown.



## Juniper Estates



**Issues:** Beginning of south side of Juniper – new bluestone added, Remaining .1 mile – lack of surface crown

**Fix:** Maintain crown on new section. Install 3-4" (pre-compacted depth) 1" minus crushed gravel or bluestone and compact to ½" per foot crown on remaining portion of road.

## Hill at Driveway # 98



**Issues:** Road is sloped to existing ditch on left (super-elevated)

**Fix:** Maintain super-elevation to left adding material as needed.

## Cedar Estates



**Issues:** Road is acting as the ditch and water not getting off surface

**Fix:** Super-elevate road to right side, for 75', so water can shed away from driving surface. Raise road base 1' with 4" minus gravel and add 6" (pre-compacted depth) of 1" minus crushed gravel or bluestone to the surface.

If runoff goes down driveway on right, install gravel water bar to move water off road surface.

## Poplar Estates



**Issues:** Lack of surface crown, water not reaching ditching, shoulder berms

**Fix:** If construction of a new house on the lot at the end is planned, wait until large vehicles are finished to improve road.

Shave shoulder berms and install 8" (pre-compacted depth) of 1" minus crushed gravel or bluestone and compact to 1/2" per foot crown on sections that have existing ditching. Areas without ditching on left should be super-elevated toward woods on right.

## Gravel Road Maintenance Log

Town \_\_\_\_\_ Road Name \_\_\_\_\_

Year \_\_\_\_\_

Notes:

Date	Work Completed/Site #	Contractor