

Edelweiss Master Roads Plan Update



Prepared by:
Edelweiss Roads Committee

Approved by:
Edelweiss Board of Directors

May, 2020

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Acknowledgments

This plan was developed by Board members, Edelweiss staff and full and part time residents of the Edelweiss community. The plan also received important input from the Firewise Committee.

The Board wishes to thank all who participating in the development of the plan including the following Roads Committee members:

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Introduction

This plan was prepared in response to a series of issues that impact the Edelweiss Community Road System. It updates the 2007 Roads Master Plan developed by the Long Range Planning Committee.¹ This update began in the spring of 2019 and was conducted by a committee consisting of three board members and approximately six members of the Edelweiss Community who are dedicated to researching and addressing Edelweiss Community's current roads issues.

This Roads Committee (RC) met once a month over the course of about one year. They began with a review of the issues and completed a road inventory. The RC developed goals to address the issues and brainstormed actions to address each issue. Edelweiss' Firewise Committee also had input into the plan stressing fire-related interests such as vegetation along roadways, reflective house numbers near the roads, and road widths suitable for fire response vehicles. Research for the plan also included a review of resources such as plats, website sources, board minutes, financial records, the Reserve Study, input by the staff and from present and former board members.

After deliberation and review by the Edelweiss Maintenance Commission Board of Directors, the plan was submitted to the membership prior to the the 2020 May Annual Meeting. It is the intent that this plan be reviewed at least every five years and recommendations be updated as needed. The plan is broken into the following sections:

- Background
- Issues and Goals
- Analysis and Recommendations
- Implementation

Background

There are 26 roads in the Edelweiss community with a total combined length of about eight miles. The roads vary in width from an average of 10 feet to over 25 feet. The roads provide access to approximately 180 homes with about 50 homes occupied year-round. All of the roads are gravel and in various stages of good- to poor-condition except for a paved section at the entrance to Edelweiss. This asphalt extends approximately 10 feet past the intersection of Highland Road and Homestead Road onto Highland Road and approximately 250 feet past this intersection onto Homestead Road. This asphalt was originally laid in 1995 and overlaid in about 2014².

Except for spot repairs, major repairs to roads in Edelweiss have historically been limited. One exception was a project in about 2008 that cost \$100,000. These funds, obtained through a low interest loan from the Okanogan County Electrical Co-op, were used to invest in additional gravel, grading and application of Lignin Sulfonate (lignin) on approximately 1.1 miles of road on Highland Drive and Homestead Road. The loan was paid off through user fees.

In the summer of 2017, Edelweiss began a water-pipe replacement project that is being done in conjunction with the Okanogan County Electrical Cooperative (OCEC) who is replacing electrical lines in the roads. The water line and electrical project is intended to take place over approximately 10 years with funds from a special Edelweiss assessment. Approximately ½ mile of road is upgraded each year. During

¹ Established by the Board of Directors in 2006 to address the Long Term Planning Needs of the community.

² Jeff Samdal and Associates, Inc, Professional Reserve Study for Edelweiss, July 31, 2018, page 19.

the project, the roads are torn up and generally reconstructed to their previous condition and in some instances to a higher standard.

In 2018, the board passed a resolution to address parking in the road. Specifically, the resolution was intended to address vehicles obstructing traffic on any road within Edelweiss or causing an obstruction or physical hazard to be placed on any road within Edelweiss. It also states that vehicles temporarily parked alongside an Association road shall be parked safely, shall not obstruct the road or any private driveway, and shall not obstruct drivers' lines of sight on the Association road alongside which they are parked.³

Road Maintenance

Approximately \$50,000 is spent in the winter on sanding and snow removal. Snow removal is done by a local contractor, while EMC staff are responsible for applying sand using a sand spreader in the back of the Edelweiss pick up. Sanding is done when needed, usually numerous times during the winter. To spread one load of sand on the roads takes approximately ½ hour and may take up to five loads of sand and trips to complete. Additional sand is provided in 8 roadside boxes for individuals to apply to the roads as needed. The current locations of these boxes is shown below in Table 1.

TABLE 1. LOCATION OF BOXES WITH WINTER SAND

Eagles Nest Road	Homestead Hill (just below Quaking Aspen)
Edelweiss Main Entrance	Mustard Mtn. and East Fawn Creek
Homestead and Highland Intersection	Mustard Mtn. and Ayers Court
Homestead and Rock Rose Intersection	River Road

Homeowners pay 100% of the total costs of sanding and snow removal as itemized expenses. Currently, snowplowing is billed 2 times per year. In 2019, the cost for the snow plowing was \$287 which was billed in two installments, in January and May. In addition to the snow plow costs, homeowners pay for the sand, equipment fuel and repairs associated with sanding the roads. The amount of the additional sanding costs are not known until the end of the winter season.

Funding for summer road maintenance primarily comes from lot owner's annual user fees. In 2019, approximately \$42,000 was budgeted for summer road maintenance. \$3,000 is also collected prior to commencement of any new home construction and goes into a road maintenance and improvement account. In 2019, the amount collected was \$12,000. In the last two years it was used for spot repairs to drainage, applying gravel and grading roads. Once Edelweiss reaches full build out, these funds will no longer be available.

Road Inventory

To better understand the existing conditions of the roads in Edelweiss, in the summer of 2019, the committee completed an inventory of the roads that considered the following criteria:

³ Parking Rules Resolution, Edelweiss Board, October 15, 2018

Roadway Use and Location

- Average width
- Road intersections
- Houses adjacent to the road
- Access to facilities

Signage

- Signs about Dust
- Speed signs
- Informational signs

Safety

- Number of reflective house numbers
- Sight Distance problems
- Vegetation Encroachments

Roadway Surface Condition

- Roadway Crown
- Washboards
- Potholes
- Surface material
- Dust
- Drainage
- Culverts
- Erosion

The results of the road inventory are included in Appendix A.

Right of Way

A careful review of the Edelweiss Plats was completed to determine the amount of Right of Way (ROW) for each of the roads in the subdivision. A ROW is a type of easement granted or reserved over the land for purposes such as roads. Ideally a road would be located in the middle of the ROW but that is often not the case. Generally, road ROW's in Edelweiss vary from 30'-60' as shown in Table 4 and illustrated in Figure 3.

Table 2. Edelweiss Community Road Right-of-Ways

Road Name	ROW
Ayer's Court	60'
Bitterbrush Road	60'
Blue Grouse Lane	20'
Cassal Road	60'
Cottonwood Road	30'
Crabapple Road (Homestead to Trillium)	40'
Crabapple Road (Homestead to Upper Meadow)	30'
Drake Drive	60'
Eagles Nest Road	30'
East Fawn Creek Road	66'
Elderberry Road	30''
Fawn Road	30'
Heather Road	30'
Highland Meadow Road	60'
Highland Rd	60'
Homestead Rd	60'
Laney Lane	60'
Lupine Road	30'
Mustard Mt. Road	60'
Quaking Aspen Road	30'-40'
Reservoir Way	64.34'

Road Name	ROW
River Road	30'
Rock Rose Road	30'
Sunflower Lane	30'
Trillium Road	30-60'
West Fawn Road	60'
Wintergreen Road	30'

Issues and Goals

The committee developed a list of issues which were presented to the board and to the full membership for comments at the May, 2019 annual meeting and at the October, 2019 budget meeting. Based on these issues a list of goals and recommendations were developed.

Issues:

Issues were identified and categorized according to Health and Safety, Road Conditions and Funding as shown in Table 3.

TABLE 3. EMC TRANSPORTATION ISSUES

Health & Safety	Dust from roadways can cause respiratory issues and limit visibility.
	Many drivers exceed the speed limit.
	Narrow roads do not allow safe travel for fire department trucks.
	Vegetation along roads could contribute to fire danger.
	Limited sight-distance and other safety issues could cause accidents.
	Signage is not uniform, needs repair and can be confusing.
Road Condition	Trespass accelerates road deterioration.
	Lack of adequate drainage causes erosion and poor road surface condition
	Washboards and potholes contribute to poor driving conditions.
	Several roads are substandard and unmaintained.
Funding	There is a lack of funding for significant road improvements.
	EMC Maintenance equipment is generally adequate for our needs but funding will be needed for its eventual replacement.
	East and West Fawn Creek Roads are poorly maintained by the U.S Forest Service which has limited to no funding for improvements.

Based on a consideration of the issues the following goals were developed.

Goals:

- 1) Suppress dust alongside roads.
- 2) Eliminate safety hazards.
- 3) Improve road surfaces.
- 4) Promote road improvements for fire suppression efforts.

- 5) Develop plan for unmaintained roads.
- 6) Provide members with funding options that improve future road conditions.

Analysis and Recommendations

This section summarizes and analyzes each Edelweiss road issue identified in the previous section and is organized by Health and Safety, Road Conditions and Funding. Recommendations are also listed to address each issue and include Short-Term (0-5 years), Medium-Term (5-10 years) and Long-Term (greater than 10 years) recommendations.

Health and Safety

The following section focuses on transportation issues relating to health and safety including, dust, fire escape routes, excessive speeds, sight distance issues and road widths.

Issue - Dust from roadways can cause respiratory issues and limit visibility.

Dust is particle pollution. The Environmental Protection Agency (EPA) states that particle pollution is linked to several health problems, including coughing, wheezing, reduced lung function, asthma attacks, heart attacks and strokes, resulting in increased hospital admissions and emergency room visits. Dust along Edelweiss's main roads and concerns about its impact to health is a common complaint among local residents. For more information about dust please see Appendix B.

Lignin Sulfonate (lignin) is used in Edelweiss and other areas in the Methow valley for dust control. This product has widespread use and is considered safe and effective.

“Lignin sulfonate is recognized as an effective dust control agent for unpaved roads. Lignin is a co-product of the paper industry and is the “glue” that holds cellulose fibers together in trees. Lignin is extracted from wood during the pulping process, which makes lignin soluble in water.

Lignin sulfonate is considered non-toxic when properly applied, making it safe for wildlife, foliage, and waterways surrounding road. Lignosulfonate treatment eliminates the sliding hazards of loose dirt and gravel by binding it to a hard, skid-resistant surface. It is also considered non-corrosive and can be applied without special safety equipment or clothing. Vehicles can safely travel over roads treated with lignosulfonates almost immediately, eliminating road closures. When properly applied, lignin sulfonate creates a hardened road surface, is less likely to suffer “washboarding,” and reduces frost heaves common with untreated gravel or dirt roads. As a result, frequent grading and maintenance can be reduced.”⁴

In the past, lignin was applied to the more well-traveled roads in Edelweiss. The applications were done sporadically and usually just once in the summer. The effects were not conclusive, but it was reported that it did reduce washboards and potholes. There are many variables that affect the success of lignin applications such as preparation of the road surface, weather and traffic volume. Continuous monitoring of the air quality will help residents to understand the extent of the dust issue and to understand the effectiveness of the lignin application.

In the summer of 2019, lignin was applied twice to Homestead Road, most of Highland Road and Cassal Road to the pool. The lignin was applied after grading. In the steeper section near the “S” curve on Highland Road, additional lignin was applied to compensate for Lignin ‘runoff’ due to steepness of the grade

⁴ <https://www.enviroad.com/dust-control/ligninsulfonate>

Dust appeared to be greatly reduced, and the road surface hardened particularly after the second application of lignin. It is the intent to continue to apply the lignin for at least two more years to measure its effectiveness. It is not known the extent to which lignin application will reduce dust in the Long-Term, but last year's results are promising. The cost for each lignin application is approximately \$20,000.

There are also dust issues along less traveled roads within the subdivision. The firm that currently applies lignin to the main roads in Edelweiss is reluctant to contract with private individuals to have lignin applied near their homes unless it is applied in conjunction with the larger effort of applying lignin on the major Edelweiss roads.

Another option to reduce dust is to pave or chip seal the road. The RC looked at potential costs to pave Highland Road and Homestead Road. The costs examined did not consider the road width necessary to accommodate fire protection vehicles and further research and analysis is needed. This option is discussed further in the Road Condition section. The application of water as a dust suppressant was dismissed due to water right restrictions for this type of use.

Short-Term Recommendations

- Continue to budget for and apply lignin twice in the summer to Highland Road, Homestead Road and the west end of Cassal Road to the pool for at least two more years.
- Monitor air quality, particularly before and after the application of the lignin through the use of at least one continuous air monitor.
- Install two signs encouraging speed reduction as means of reducing dust.
- Send out an annual reminder to members about the need to obey the speed limits in order to reduce dust and road deterioration.
- Provide opportunity for homeowners to pay for lignin application on their section of road.

Medium/Long Term Recommendations –Analyze paving and continued gravel surface options as discussed on page 16 under road condition discussion.

Issue - Many drivers exceed the speed limit.

Exceeding the speed limit is a serious issue in Edelweiss. Not only is it a safety concern for pedestrians and vehicles, but in the summer it contributes to dust, washboards and potholes. Traffic volume is increasing due to vehicles trespassing to access forest service roads north of Edelweiss during summer biking and fall hunting seasons.

The previous road plan considered ways to reduce speeds along Edelweiss roadways including traffic calming. In about 2007, 4 removable plastic speed bumps were installed on Edelweiss roadways. Several problems were caused by the speed bumps; they required large trucks with trailers to stop and put their vehicles in 4WD, holes formed near the speed bumps, they were a safety concern for bicyclists, and they had to be removed for winter snow plowing and summer grading⁵. The previous road plan concluded that “community awareness and persistent advocacy by the membership continues to be the most effective and efficient means of approaching this issue.”⁶

The RC also examined the current speed limit signs. Several black and white 15 mph speed limit signs are located along Homestead

⁵ Interview with Craig Hook, Operations Manager, Winter 2020.

⁶ 2007 Edelweiss Master Road Plan



FIGURE 1. EXAMPLE OF SPEED LIMIT ON PAVEMENT

Road and Highland Roads. In addition, at most intersections on Homestead Road and Highland Road are wooden 15 mph road signs, many of which have deteriorated and are hard to read.

Potential improvements to the current speed limit signs were considered. One option is to use lettering on the paved section near the entrance similar to Figure 1 **Error! Reference source not found.**. Another option is to install a radar speed feedback sign similar to Figure 2. Research indicates these devices may be effective at reducing vehicle speed. Cost to buy a radar speed-feedback unit is about \$3,600 or about \$400 to rent for one month. There may be opportunities to share costs with one or more other Homeowner Associations in the Methow.



FIGURE 2 RADAR SPEED FEEDBACK SIGN

Short-Term Recommendations

- Send out an annual reminder to members about the need to obey the speed limits in order to improve safety, reduce dust and limit road deterioration. Include a recommendation for homeowners using contractors to remind them to obey the speed limits.
- Install speed limit signs at entrance to the community and at appropriate intervals.
- Paint portion of paved road at entrance with speed limit.

Medium/Long-Term Recommendation

- If speed continues to be an issue, consider renting or buying a hand held or portable speed radar unit and determine if effective.

Issue - Narrow roads do not allow safe travel for fire department trucks. Roads in Edelweiss generally vary from 12' to 24' with few turnouts. According to research and local fire response input, a fire access road should be a minimum unobstructed width of 20'.⁷ Narrow roads can also be dangerous for safe passage of two vehicles.

The anticipated road improvements associated with the water project in many cases will result in wider roads. To assist in prioritizing road improvements for fire access and to eliminate insufficient road widths on major roads, the RC analyzed information from the road inventory. The RC classified roads according to the number of lots served and their importance in exiting the Edelweiss Community and providing emergency services to the community. The RC then used the classification information to prioritize improvements. This was especially important as the water project moves forward and there are opportunities to select the order of road improvements.

Roads were classified according to the following:

1 - Primary Roads - Generally these major roads provide direct access to over 20 homes, have more than 5 road intersections, with assumed Average Daily Traffic (ADT) of 50 vehicles or more or have other significant features. Highland and Homestead Roads are classified as primary roads. Homestead Road provides access to about 120 homes and Highland is used to access about 60 homes. The west end of Cassal Road is also considered a primary road because it provides access to the pool which is a major attraction in the summer. Other primary roads are West and East Fawn Creek Roads. Although both are USFS Roads, their importance as potential fire-escape routes elevate them to primary roads. Widening

⁷ Port Ludlow Fire and Rescue, Guidelines for Fire Apparatus Access Roads, Driveways & Bridges, <http://plfr.org/about-plfr/docs/PLFR-Fire-Apparatus-Access-Requirements.pdf>

and maintaining these roads are the responsibility of the USFS, but they seem to have little interest in investing in road improvement or maintenance beyond current levels. Highland Meadow Road connects to Homestead Road and provides access to East Fawn Creek Road and therefore is also classified as a primary road. Approximately 3 miles classify as Primary Roads.

Primary roads, particularly Highland and Homestead Roads, should receive the most immediate maintenance and should have minimum widths of 20' with 2' shoulders wherever possible. Generally, these roads already meet these standards. However, Highland Road downhill from the pump house near Quaking Aspen and Trillium does not meet this desired width, and it is considered a high priority for improvement. In other instances, such as on Highland Road east of Crab Apple Road, it may be impractical to reconstruct the road to this desired width

2 - Secondary Roads - Generally, these important roads intersect a primary road, provide direct access to over 10 homes, have 2 or more road intersections and may provide vital fire escape routes. Examples of secondary roads include Bitterbrush Road, Crab Apple Road, East end of Cassal Road, Mustard Mountain Road and Quaking Aspen Road. Secondary Roads should be at least 18 feet wide with 2' shoulders. Approximately 2 miles classify as Secondary Roads.

3 - Local Roads - These are all of the remaining roads in Edelweiss. These generally are dead end roads, serve fewer than 10 homes and have low traffic volumes. These roads should be a minimum of 12' wide with 2' shoulders. Approximately 3 miles classify as local roads.

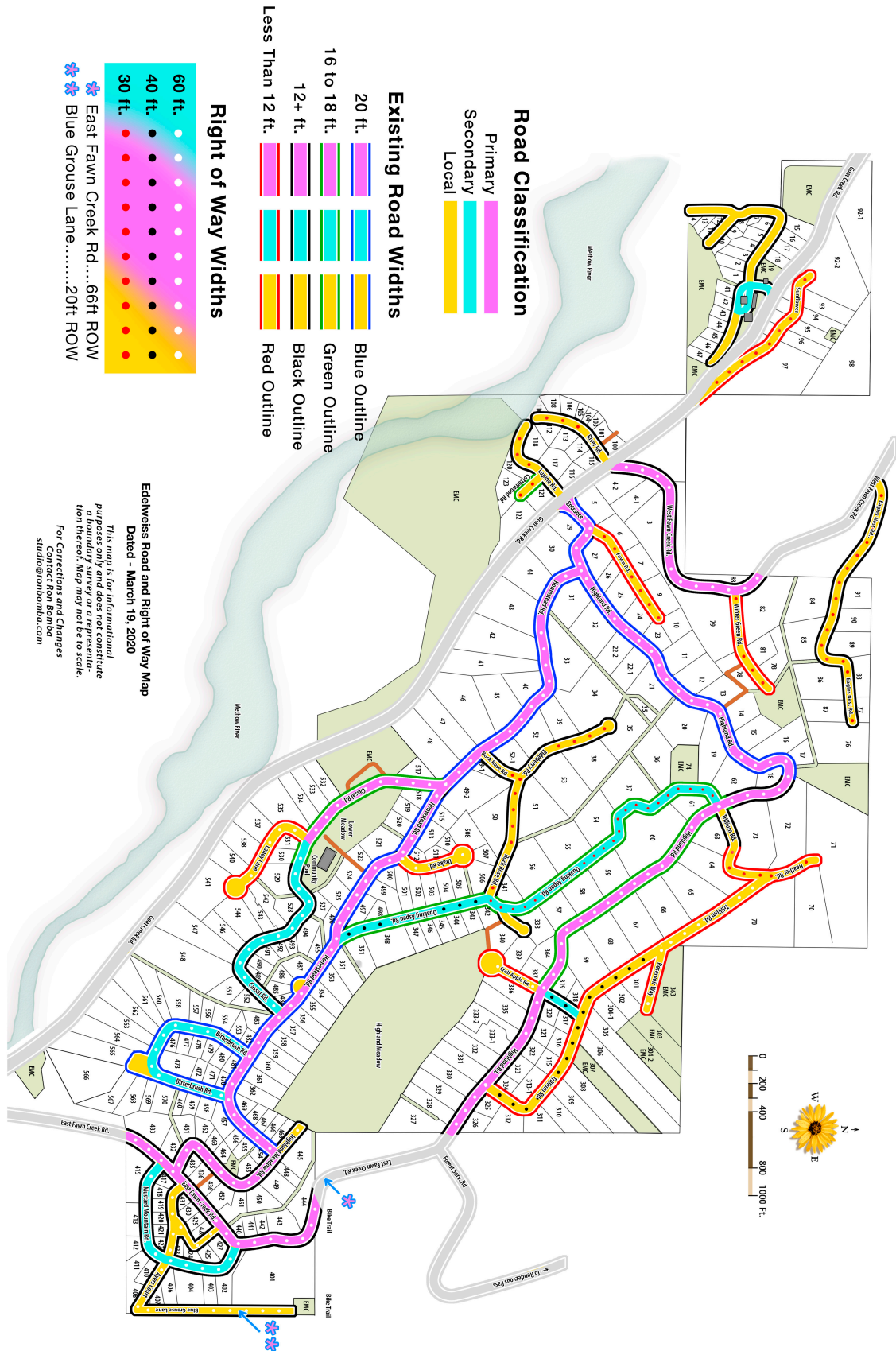
Table 4 summarizes the Road Classification system developed for Edelweiss Roads and indicates the desired width and deficiencies. There are design difficulties, ROW or other issues which may prevent some roads from meeting the desired road widths. In some cases it may be necessary to consult a roads engineer to redesign the road such as on Highland Road at the curve east of Quaking Aspen Road. The road classifications information, along with road width and right-of-way information is shown in Figure 3.

TABLE 4. ROAD CLASSIFICATION SUMMARY

Road Classifications/Mileage	Road Names	Desired Road Design	Width Deficiencies
Primary Roads/3 miles	1) Highland Rd 2) Homestead Rd 3) West end of Cassal Rd 4) West and East Fawn Roads 5) Highland Meadow Rd	20' wide, 2' shoulders	1) Highland Rd West of Quaking Aspen 2) Highland Rd East of Crab Apple* 3) Highland Meadow Rd*
Secondary Roads/2 miles	1) Bitterbrush Rd 2) Crab Apple Rd 3) East End of Cassal Rd 4) Highland Meadows Rd 5) Mustard Mountain 6) Quaking Aspen Rd	18' wide, 2' shoulders	1) Highland Meadows Rd* 2) Portions of East End of Cassal Rd*
Local Roads/3 miles	All other roads	12' wide, 2' shoulders	1) Drake Rd 2) Fawn Rd* 3) Heather Rd* 4) Laney Lane* 5) Reservoir Rd* 6) Sunflower Rd 7) Trillium Rd 8) Rock Rose Rd above Pressure Reducing Valve (PRV) vault.*

*Road widening not recommended at this time due to limited right of way, topography or other factors.

FIGURE 3. EDELWEISS ROAD ROW, CLASSIFICATION AND ROADWAY WIDTH MAP



Short-Term Recommendations

- Work with OCEC to prioritize work on roads with width deficiencies as much as possible.
- Consult with engineer as needed for appropriate design in critical problem areas such as the 'S' curve on Highland Road.
- Identify appropriate areas for turnouts to accommodate emergency vehicles and widen roads in these areas as funding and opportunities allow

Medium and Long-Term Recommendations

- Continue to maintain road widths

Issue - Vegetation along roads could contribute to fire danger. The road inventory identified that most roadways in Edelweiss have vegetation close to or encroaching upon the roadway, reducing sight-distances and increasing fire risk. Roads where there is a significant gap in vegetation can act as a firebreak to slow or stop the progress of fire.

The Firewise Committee is taking an active role in reducing vegetation near the sides of the road as well as the canopy above the roads. In 2020, they plan to remove vegetation in conjunction with the OCEC and water line project.

Short, Medium and Long-Term Recommendations

- Support efforts by the Firewise Committee to reduce vegetation along roadways.

Issue – Limited sight distance and other safety issues could contribute to accidents. There are a few areas that residents have identified as roadway safety concerns. These include

- Highland Road narrows at the curve below Quaking Aspen causing sight distance issues
- A sight distance problem at the intersection of Rock Rose Road and Homestead Road, particularly in the winter when driving conditions on Rock Rose are icy.
- Lack of warning for traffic on Homestead Road to yield to downhill traffic on Highland at the Highland and Homestead intersection.
- Lack of warning for traffic at the east end of Cassal Road curve to slow down to prevent accidents
- Rock Rose Road pressure reducing valve (PRV) vault intrusion onto the roadway

The RC discussed each of the safety issues and developed the following recommendations.

Short-Term Recommendations

- Prioritize the narrow Highland Road section in future OCEC/Edelweiss Water and Road project.
- Consult road engineer on best road design as needed.
- Install a Yield sign on Homestead Road at the intersection with Highland Road.
- Install and monitor effectiveness of reflectors at the curve on the east end of Cassal Road.
- Review options for eliminating or moving the PRV vault on Rock Rose Road.
- Research cost-effective measures for reducing sight distance issue at Rock Rose Road and Homestead Road.

Medium/Long-Term Recommendations

- Continued vigilance.

Issue - Signage is not uniform, needs repair and can be confusing. In addition to street signs, there are approximately 25 signs along roads in Edelweiss. Examples of signs include: EMC is a private community, off-road vehicles prohibited, dust, dead end, and speed limit signs. Almost half of the signs are wooden,

routed signs in various stages of deterioration. The wooden signs include 15 mph speed limit signs located at most intersections along Homestead Road and Highland Road. Several “Dead End” wooden signs are also located in the community.

While not all signs are effective, they can be used to call attention to unexpected conditions on or adjacent to roads and to situations that might not be readily apparent to road users. For instance, they can act as a reminder of the speed limit, encourage drivers to slow down to reduce dust and limit road deterioration and can also inform others from outside the community that trespass is not allowed.

The RC developed the following sign recommendations to address speed, trespass, dust, safety and unmaintained road issues. It is the intent that existing signs be used as much as possible. These locations are meant to be used as a guide but their precise locations will be determined by staff in consideration of existing sign posts, visibility, etc.

Short-Term Recommendations

- Edelweiss Entrance
 - Make existing Highland Road sign at intersection to Edelweiss more visible by cutting brush and using a cantilevered bracket to make road sign more visible.
 - Replace green sign at entrance with green sign that says: “Private Community, Welcome Residents and Guests, 15 MPH”
 - Remove wooden sign about tracked vehicles.
 - Install new red and white sign that indicates private property, no trespassing, no unauthorized vehicles, no hunting
 - Mark pavement with large lettering – SLOW 15 MPH
- Highland and Homestead Intersections
 - Install black and white “Private Road, 15 mph” sign on Highland and Homestead Roads
 - Install yellow and black “Yield” sign on Homestead Road facing uphill (east) to communicate to downhill traffic on Homestead Road to yield to traffic traveling downhill on Highland Road.
- ‘S’ Curve on Highland Road
 - Install yellow and black “SLOW, Help keep dust down”
 - Install yellow and black “SLOW, Save our Gravel”
 - Install “4WD Recommended”
- “S’ Curve on Homestead Road
 - Install yellow and black “SLOW, Help keep dust down”
 - Install yellow and black “SLOW, Please save our Gravel”
 - Install yellow and black “4WD Recommended”
- Homestead Road at Cassal Road intersection
 - Install black and white “Private Road 15 MPH”
- Highland Road at cattle guard
 - Install green” Private Community, No Trespassing, 15 MPH”
 - Remove existing wooden signs
- East Fawn Creek Road (FS Rd 100) at northern entrance to EMC near cattle guard
 - Remove existing signs
 - Install green” Private Community, No Trespassing, 15 MPH”
- East Fawn Creek Road (FS Rd 100) at entrance to Edelweiss
 - Install green” Private Community, No Trespassing, 15 MPH”
 - Methow trail sign at Goat Creek Road to direct mountain bikers to access trails via FS Rd 100 (East Fawn Rd) if supported by Methow Trails.

- Rock Rose above intersection with Elderberry Road, at PRV vault
 - Install red and white “Very Primitive Unmaintained Road, Enter at your own risk”
- Rock Rose at Quaking Aspen Intersection
 - Install red and white “Very Primitive Unmaintained Road, Enter at your own risk”
- West Trillium and Highland Intersection
 - Install red and white “Very Primitive Unmaintained Road, Enter at your own risk”

Medium/Long-Term Recommendations

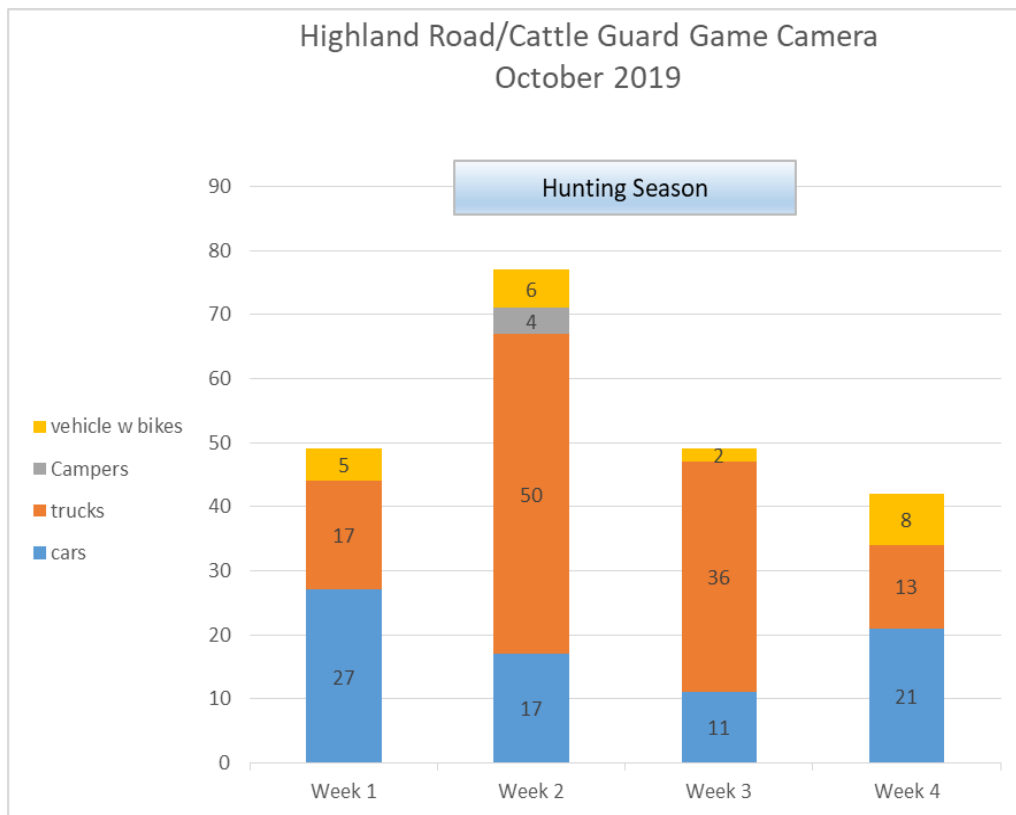
- Review the effectiveness of signage on an annual basis.
- If excessive speed remains an issue, consider the option of purchasing or renting a portable radar sign that indicates traveler’s speed.

Road Condition

Issue - Trespass accelerates road deterioration. Edelweiss residents pay for road maintenance throughout the community. Residents have noticed an increase in the numbers of non-residents using the roads to access the Rendezvous area, particularly hunters and vehicles with bicycles including bicycle-tour groups in vans.

The RC analyzed traffic before and after hunting season on Highland Road at the Cattle Guard as shown in Figure 4.

FIGURE 4. TRAFFIC DATA ON HIGHLAND ROAD, HUNTING SEASON, OCTOBER, 2019



The amount of traffic using Highland Road or Homestead Road to access trails in the Rendezvous area is unknown. There are plans to collect additional data in the summer of 2020 to determine the number of

non-residents using Highland and Homestead Roads to access bicycle routes in the Rendezvous area. The RC would like to collect traffic data on both roads and try closing the gate at the Highland Road cattle guard for short periods (with a lock that residents can use to travel on the road). Data would continue to be collected during this time. The RC also suggested that the Administrative Manager contact the bike shop and encourage them to provide their customers information about alternative ways to access bike trails in the area. Methow Trails sign at the intersection of FS Road 100 and Goat Creek could alert potential cyclists about this alternative route.

Short-Term Recommendations

- Write a letter to the editor of the Methow Valley News and social media regarding bicycle and vehicle access through Edelweiss
- Install “No Trespass” signs at entrances to Edelweiss
- Collect vehicle data on Homestead Road and Highland Road in June
- Collect vehicle data on Highland and Homestead Road during hunting season, 2020
- Consider closing the gate on Highland during one week of hunting season and at random times to measure the impact to traffic

Medium/Long-Term Recommendations

- Monitor the effectiveness of trespass measures and reevaluate options as needed.

Issue - Lack of adequate drainage causes erosion and poor road surface condition

Drainage is critical in maintaining roads and preventing a poor surface condition.⁸

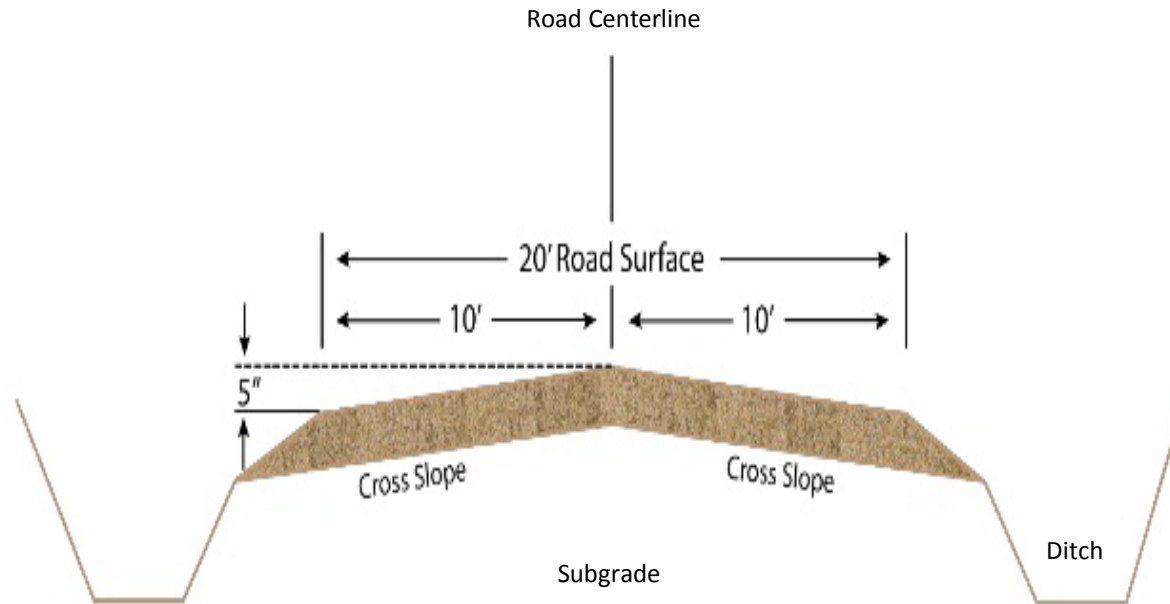
“In many ways, all the most important steps of gravel road construction are related to drainage. Roads that allow water to properly drain off the surface and out of roadbed soils are much easier to maintain and therefore less costly. Conversely, gravel roadways with poor drainage can never fully be maintained. Any standing water on or adjacent to the road will compromise its integrity.”⁹

Roads are typically constructed with a slope from the centerline of the road to the edge of the road (called a crown) so that water can drain off the surface into the ditch. When the slope is too flat, the water can pond on the road, causing ruts and potholes. A basic cross section for a twenty foot road is shown in Figure 5. A road constructed to these standards is generally easier and cheaper to maintain.

⁸ https://www.epa.gov/sites/production/files/2015-10/documents/2003_07_24_nps_gravelroads_sec1_1.pdf

⁹ <https://blog.midwestind.com/7-crucial-factors-building-great-gravel-road/>

The road inventory showed that most of the roads in Edelweiss have poor drainage. In some cases, ditches are present, but clogged or they are non-existent. Over the years, drainage ditches have filled to the point that the Edelweiss road system has an inferior system of managing storm water and spring



Note: 4% crown is equivalent to 1/2 inch per foot drop on the cross slope.

freeze/thaw cycles. One of the primary contributors to this problem is the community's winter sanding operations which eventually end up filling drainage ditches. "Runoff" damage is most evident where potholing and wash boarding is prevalent. This results in the need for more frequent grading, especially on Homestead Road and Highland Road which experience the most traffic, receive the most frequent sanding, and therefore have the worst drainage in Edelweiss. Additionally, the community has not required all homeowners to install culverts where driveways are built to access the road. Where ditches do exist this causes a drainage barrier or "stop" and contributes greatly to the amount of road damage from runoff.¹⁰ There is also concern with the lack of a crown which is discussed further in the next section. Edelweiss staff clean out culverts with a shovel but do not have equipment for cleaning out and shaping ditches.

The 2018 Reserve Study recommends an annual budget of \$4,000 for storm system expenditures with adjustments as necessary to respond to the need.¹¹

Short-Term Recommendations

- Support new language from the Architectural Guidelines regarding drainage for new construction projects.
- Clean out obstructed drainage ditches and culverts.

¹⁰ 2007 Edelweiss Master Road Plan

¹¹ Jeff Samdal and Associates, Inc, Professional Reserve Study for Edelweiss, July 31, 2018, page 19

Medium and Long-Term Recommendations

- Consult with an engineer about potential drainage improvements in the subdivision.
- Perform drainage improvements as recommended by the engineers and as funding allows.

Issue - Washboards and potholes contribute to poor driving conditions.

Ideally, a road should have a surface with sufficient slope from the centerline to the edge to allow water to effectively drain off of the road as shown in Figure 5. When a road has a good crown it can usually be maintained by routine blading with proper equipment and adding gravel where necessary, but sometimes major grading and reshaping is necessary due to prolonged wet weather or unusually heavy traffic.

With the current on-going road upgrades associated with the water line replacement project, roads are often improved and widened. However, it is not clear if the roads are being reshaped to have adequate slopes or surface material.

Edelweiss currently has a piece of equipment known as a “box scraper” which is mounted on a light duty tractor. A box scraper in essence “planes” the road to a flat surface and is sometimes used in Edelweiss to smooth the road surface, particularly those with severe washboards. Over time, the use of the box scraper on the roads can flatten the crown that was originally designed for the roads. This contributes to water ponding on the surface causing potholes and an increase in wash-boarding. The problem appears to be cyclical in nature. The more roads are graded with the box scraper, the flatter the roads become, the more and deeper potholes appear, the sooner wash-boarding returns, thus, requiring more grading to maintain acceptable road standards. While lignin, applied after the roads are graded, may harden the surface and reduce the potholes and washboards, the road top course in many places has worn to a point that additional gravel and a proper crown with appropriate equipment is needed.

While the box scraper has other uses, it is not intended to replace road work that can be done with a grader. A grader has an adjustable blade, a longer wheelbase, significant more weight, and generally cost more than \$200,000.¹² A grader also can require costly repairs and may require a trailer and truck to haul it. As part of the lignin project in 2019, a contractor was hired to resurface, grade and crown the road with a grader. The grader also was used to clean out some of the ditches which cannot be done with Edelweiss’ current equipment.

One solution to poor surface conditions discussed above is to pave or chip seal the roads. Some RC members support paving the main roads in Edelweiss by applying a hot mix asphalt (asphalt). They suggest that if the community continues with twice-annual expenditures of ~ \$40K for lignin application, that same amount could eventually pay for the paving, albeit over a 20 year or greater horizon.

However, there is some debate on whether or not to pave all, some, or none of the remaining gravel roads with asphalt. Reasons cited for not paving the roads include the following:

- High initial costs associated with paving options
- Likely increase in vehicle speeds which could endanger pedestrians and increase likelihood for vehicular accidents
- Would require excavation to allow connection with water lines servicing any new home adjacent to the paved road
- Paved surfaces could be more slippery and require more sanding
- Difficulty of finding a contractor to patch the pavement

¹² <https://www.costowl.com/b2b/construction-equipment-new-motor-graders-cost.html>

- Cost of patching and maintaining the paved surface
- Crumbling at the edges of the pavement due to heavy vehicles
- Some members believe gravel roads are more compatible with the rural nature of the area.

According to the 2018 Reserve Study, with approximately 8 miles of road at an assumed width of 24 feet translates into approximately 1,013,760 square feet of roads. With this quantity of road, the cost to lay asphalt on all of these roads would be approximately \$3.85 per square foot (including tax), which translates into an approximate total cost of \$3,902,976. Therefore, to lay pavement on all roads in Edelweiss, this would translate into a cost per lot of \$13,275 (assuming 294 lots).

The 2018 Reserve Study estimated it would cost \$482,872 to pave one mile of road which would mean a cost of \$1,659 per lot for each mile paved. Based on this estimate, to pave only the more heavily used roads of Highland Road, Homestead Road and Cassal Road to the pool, the costs would be approximately \$1,107,876 or \$3,768 per lot as shown in Table 5. If the width was reduced to 20' these costs would be reduced by approximately 5 percent and result in a cost of \$3,140 per lot. The life span of a paved road is approximately 15-25 years with an application of a thin overlay every 7-10 years. Currently residents pay about \$135 a year for grading these roads and two annual applications of lignin.

TABLE 5. ESTIMATED PAVING COSTS FOR 24' ROADS

Road Segment	Linear feet	20 Foot Road			24 Foot Road		
		Sq ft	Total Costs	Cost per lot*	Sq ft	Total Costs	Costs per lot*
Homestead to Cassal	1,840	36,800	\$141,680	\$482	44,160	\$170,016	\$578
Cassal to Pool	1,100	22,000	\$84,700	\$288	26,400	\$101,640	\$346
Homestead from Cassal to Highland Meadows	3,250	65,000	\$250,250	\$851	78,000	\$300,300	\$1,021
Highland, Entrance to Quaking Aspen	3,000	60,000	\$231,000	\$786	72,000	\$277,200	\$943
Highland, Quaking Aspen to CG	2,800	56,000	\$215,600	\$733	67,200	\$258,720	\$880
TOTAL	11,990	239,800	\$923,230	\$3,140	287,760	\$1,107,876	\$3,768

*Assumes 294 lots

A less expensive option than creating an asphalt surface on the roads is applying chip seal. Chip sealing is a process of covering a gravel road with a layer of liquid asphalt and then a layer of small rocks embedded in the asphalt. It prevents water from penetrating the road surface, improves skid resistance and suppresses road dust. Chip seals are typically used on rural roads carrying lower traffic volumes.¹³ The life of a chip-seal road is usually much shorter than an asphalt surface and in this area is more typically used on top of an asphalt surface to extend its life.

While paving Edelweiss roads may be the eventual solution, this concept has not been well-received by members of the community. When last polled in ~2014, there were only four members in favor of paving

¹³ <https://careertrend.com/how-6931284-chip-seal-gravel-road.html>

the roads. Whether or not paving is the eventual solution, upgrades to the existing roads would need to be completed prior to any paving activities. Road improvements associated with the water project would also need to be completed prior to paving. The question of whether to chip seal, pave the main roads with asphalt is pre-mature at this time.

Short-Term Recommendations:

- Install signs to encourage drivers to use 4WD and drive the speed limit.
- Research costs for additional grading to address issues relating to the road profile and lack of crowns on Edelweiss Roads.
- Direct contractor upgrading roads (in association with the water line project), to reconstruct roads with appropriate slope and quality and quantity of surface material.

Medium/Long-Term Recommendations

- Conduct a cost-benefit analysis to determine if chip seal or paving roads in Edelweiss is a worthwhile and sustainable option.
- Share results of the cost-benefit analysis with the community.
- If supported by community, develop funding scenarios and implement a project to pave or chip seal main roads in Edelweiss.

Issue - Several roads are substandard and unmaintained.

The west end of Trillium Road, East Fawn Creek Road and Rock Rose beyond the (PRV) are substandard, and unmaintained and seldom used. Topography is the primary reason for their current condition, and bringing them up to even minimal standards would be very expensive. After significant discussion the RC was in general agreement that they should be sufficiently maintained so they can serve as secondary emergency exit routes. USFS Road 100 (East Fawn Creek Road) and West Fawn Creek Road) have their own set of unique circumstances beyond our direct control, which were discussed previously and are analyzed further later in this plan.

Short-Term Recommendations

- Install signs to discourage travel on the west end of Trillium and Rock Rose.
- Continue to provide nominal maintenance to Trillium and Rock Rose Road to allow emergency exit/access only.

Funding

Issue - There is a lack of funding for significant road improvements.

Edelweiss roads are an important part of the infrastructure of Edelweiss and require maintenance and improvements to meet the needs of the community. The needs outlined in this plan such as dust control, access for fire protection and safety have changed due to more traffic than in the past. As Edelweiss grows, these needs are likely to continue to grow. Some maintenance can be met by Edelweiss staff but most improvements require hiring outside contractors.

The RC discussed several funding mechanisms should significant road improvements be needed. These included special assessments, conventional and other types of bank loans. With the current special assessments for the water/road improvement project and the reserve fund, RC members believed it unlikely there would be support for any additional special assessments at this time without compelling evidence for the need. Conventional bank loans and other types of loans would be unlikely to be successful because of the lack of low income residents. It is not expected that this situation will change in the near future.

Currently, funds are allocated through the water line improvement project to widen and resurface roads. In this way, Edelweiss is not postponing a solution but is taking care of it over time and in the most efficient way.

Generally, the short-term recommendations contained in this plan require minimal funding. At this time, it is unlikely that significant additional funding will be requested from the membership for road improvements.

Short-Term Recommendations

- Continue to include road maintenance funds in the annual budget and adjust to meet appropriate cost of living increases.
- Continue to budget adequate funds to make improvements to the roads to meet the standards as per this plan in each annual water line improvement project.
- Survey members to determine if there is support to increase funding for road improvements.

Medium/Long- Term Recommendations

- Continue to include road maintenance funds in the annual budget and adjust to meet appropriate cost of living increases.
- Continue to budget adequate funds to make improvements to the roads to meet the standards as per this plan in each annual water line improvement project.

Issue - EMC Maintenance equipment is generally adequate for our needs but funding will be needed for its eventual replacement.

To maintain roads in Edelweiss there is a well-used Belarus Tractor (Bella) with a front end loader and box scraper that are aftermarket add-ons. All were purchased used in 2000. The tractor is at or near the end of its serviceable life¹⁴ Bella is used to pick up equipment, haul gravel, move rocks, trees, plow snow, load sand, etc. The box scraper is used for minor road repairs and as stated previously is sometimes used to reduce washboards which has resulted in loss of the road crown. These are light duty pieces of equipment that cannot be used to reestablish or maintain the crown on the roads or clean ditches. The estimated costs to replace the tractor is \$60,000.¹⁵

Other equipment includes one Chevy 2500 pick-up truck and one Ford F-350 diesel crew cab pick-up truck. Both are 1999 vintage. One truck is emptied of the plow and sander so it can be used as a summer work truck. One of the pickups has a BOSS plow that needs a new blade but should continue in service for many years to come. There are also two sanders of unknown vintage that can be mounted on the pickups for winter sanding operations. One of the sanders is no longer made but parts are fairly universal.

Sanding and plowing is hard on equipment. These vehicles will need more repairs as time passes. The timeline for replacement of the pickups is probably 0-10 years. The costs to replace a pick-up truck with a slightly used one is approximately \$40,000.¹⁶

¹⁴ Jeff Samadal and Associates, Inc., Professional Reserve Study for Edelweiss, July 31, 2018, page 30.

¹⁵ Ibid

¹⁶Ibid, page 29.

A Reserve Study was completed in 2018 and updated in 2019. The study included costs to replace maintenance equipment and as a result of the study, a special assessment was approved by the membership to begin to develop a reserve that is intended to be used to pay for replacement vehicles.

As stated earlier, the box scrapper is inadequate to properly maintain the crown on the road. However, a grader is an expensive piece of equipment and probably not a reasonable purchase option. When Bella is replaced there may be options for a new tractor with a grader attachment.

Short-Term Recommendations

- Continue to maintain and repair maintenance vehicles
- Replace pick-up as needed with a slightly used one when it is no longer serviceable using the Reserve Funds.
- Replace Bella as needed with a slightly used one when it is no longer serviceable using the Reserve Funds.

Issue – East and West Fawn Creek Roads are poorly maintained by the U.S Forest Service which has limited to no funding for improvements.

The U.S Forest Service nominally maintains both East and West Fawn Creek Roads which provide access for some Edelweiss residents. While both roads are important fire escape routes, East Fawn Creek Road, (USFS Road 100) is almost impassable and is closed in the winter. West Fawn Creek Road is closed in the winter beyond Eagle’s Nest Road. West Fawn Creek Road provides access to fourteen homes. Due to the poor condition of East Fawn Creek Road and lack of winter maintenance, residents generally access their property from Homestead Road.

East Fawn Creek is in very poor condition with areas of erosion and a general lack of surface material. It provides access to USFS lands and trails in the Rendezvous area. It also could serve as vital access for Edelweiss residents in case of fire. Improvements to this road may reduce trespass on Homestead Road and Highland Roads by recreational users and hunters who use these subdivision roads instead of U.S. Forest Road 100.

Board members have contacted and met with USFS personnel and other officials to learn of any funding opportunities to make repairs to U.S. Forest Road 100. To date, there has been no success in finding a funding source or entity interested in assisting with improvements to USFS Roads in the community. There are currently no viable options to improve this USFS road.

Short/ Medium/Long-Term Recommendation

- The board should continue open communication with the USFS and monitor possible funding opportunities for both East and West Fawn Creek Roads.

Implementation

The following table illustrates the recommended actions shown in the previous section and indicates the roles and funding necessary to ensure implementation. It also lists specific goals that the action will address. In some cases costs are not known at this time. Further refinement of the implementation plan will need to occur during Plan updates.

Short-Term Actions								Responsibility
	Suppress Dust	Eliminate Safety Hazard	Improve Road Condition	Aid FireWise Program	Plan for Unmaintained Rds	Provide Funding	Cost	
Apply lignin 2x/summer, 2 more years	x	x	x				\$ 40,000/yr	EMC Budget, Staff, Contractor
Monitor air quality		x					\$ 250.00	EMC Budget, Staff, Volunteers
Improve signage: speed limits, yield, very primitive roads, members and guests only, No Trespass, use 4WD	x	x	x		x		\$ 1,700.00	EMC Budget, Staff
Remind residents annually to respect EMC roads	x	x	x	x	x			EMC staff
Allow lower priority roads to apply lignin	x		x					EMC Staff, Owners who want lignin
Prioritize OCEC/Water projects to widen roads		x	x	x				EMC Budget, Staff, Contractor
Paint paved road at entrance with speed limit	x	x	x				\$ 1,000.00	EMC Staff, Contractor
Create turnouts and widen roads, as practicable		x	x	x				EMC Staff, Contractor
Reduce vegetation along roadways		x		x				Firewise Committee, Board, volunteers
Install reflectors or other device at E. End Cassal Rd, Rock Rose, Homestead Rd.		x					\$ 200.00	EMC Staff. Volunteers
Eliminate or move PRV vault on Rock Rose		x		x	x		\$ 10,000.00	EMC Budget, Staff, Contractor
Write letter to Editor re: bicycle and vehicle access	x	x	x					EMC Staff
Collect vehicle data on Highland & Homestead in June, Hunting Season, other times	x	x	x					Roads Committee (RC)
Lock gate on Highland 1 wk in hunting season and randomly			x					EMC Board, Staff
Monitor effectiveness of trespass efforts			x					EMC Board, Staff, RC
Add new language to Architectural Guidelines re: drainage for new construction projects			x					EMC AC Committee, Board
Clean out existing culverts, crown roads			x					EMC Staff, Contractor
Update life-cycle cost estimates for asphalt, chip seal, and continued lignin applications	x	x	x	x		x		EMC Board, RC
Continue normal maintenance for Trillium and Rock Rose to allow emergency use only		x		x	x			EMC Staff
Continue road maintenance funding, survey members	x	x	x	x	x	x		EMC Budget
Continue to maintain, repair, and replace road equipment, as needed	x	x	x	x	x	x		EMC Budget
Continue open communication with USFS and other possible funding opportunities for E. & W. Fawn Rds.	x	x	x	x	x	x		EMC Board

Medium- and Long-Term Actions	<div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Suppress Dust</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Eliminate Safety Hazard</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Improve Road Condition</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Aid FireWise Program</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Plan for Unmaintained Rds</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Provide Funding</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Cost</div> </div>							Responsibility
	Medium-Term Actions							
Rent or buy speed radar unit & determine its effectiveness, if speed continues to be an issue	x	x	x				350-400/mo	EMC Budget, Staff
Continue to maintain road widths		x		x			unknown	EMC Budget, Staff
Reduce vegetation along roadways		x		x				Firewise Committee, Board, volunteers
Continued vigilance for safety and trespass issues	x	x	x	x	x	x		EMC Budget, Staff, Contractor
Analyze cost and support for paving, chip seal, and lignin options for main roads	x	x	x			x	TBD	Board, RC volunteers
Consult engineer re: drainage improvements			x				unknown	EMC Budget, Staff, Contractor
Implement engineer's recommendations			x				unknown	EMC Budget, Staff, Contractor
Continue to maintain, repair, and replace road equipment, as needed	x	x	x	x	x	x	40,000-60,000	EMC Budget, Reserve Funds
Continue open communication with USFS and other possible funding opportunities for E. & W. Fawn Rds.	x	x	x	x	x	x		EMC Board
Long-Term Actions								
If supported by community, develop funding scenarios and implement a project to pave or chip seal main roads.	x	(x)	x	x		x	unknown \$\$\$	Board, RC volunteers
Continue to maintain road widths		x		x			unknown	EMC Budget, Staff
Reduce vegetation along roadways		x		x				Firewise Committee, Board, volunteers
Continued vigilance	x	x	x	x	x	x		EMC Budget, Staff, Contractor
Consult engineer re: drainage improvements			x				unknown	EMC Budget, Staff, Contractor
Implement engineer's recommendations			x				unknown	EMC Budget, Staff, Contractor
Continue to maintain, repair, and replace road equipment, as needed	x	x	x	x	x	x	40,000-60,000	EMC Budget, Reserve Funds
Continue open communication with USFS and other possible funding opportunities for E. & W. Fawn Rds.	x	x	x	x	x	x		EMC Board

Appendix A. 2019 Road Inventory

	Roadway Use and Characteristics					
<i>Road Name</i>	<i>Length (miles)</i>	<i>Average Width/ft</i>	<i>Rd Intersections</i>	<i>Houses along route</i>	<i>Turnouts</i>	<i>Comments</i>
Ayer's Court	0.05	12.0	2	2	0	
Bitterbrush Road	0.25	20.0	2	15	0	Rd with shoulders 20"
Blue Grouse Lane	0.23	12.0	1	2	0	Access to Reservoir well house
Cassal Road (east end to west end)	0.50	17.6	2	13	3	access to pool, wide spots about 20' could be used for turnouts
Cottonwood Road	0.04	18.0	1	2	0	
Crab Apple Road	0.06	12.0	2	2	0	Shoulders about 4', more at intersections
Drake Dr	0.08	10.0	1	5	0	2' shoulders
Eagles Nest Road	0.20	12.0	2	7	0	Intersects with W Fawn, side road near top
East Fawn Road	0.35	12.0	3	5	0	provides access to pump house
Elderberry Road	0.14	12.0	1	4	1	turnaround at end of rd., access to trail
Fawn Road	0.14	10.0	1	3	1	small parking area at start
Heather Road	0.03	9.5	1	0	0	
Highland Meadow Road	0.23	12.0	2	8	0	Few 18' wide spots
Highland Rd (Ent to Switchback)	0.54	20.0	1	8	1	First 625' paved, Access to Highland Booster
Highland Road (SBk to CrabApple)	0.47	16.0	2	1	0	Width narrows from 20-13' after Q.A., no shoulders steep dropoff
Highland Road (CrabApple to CattleG.)	0.59	12.0	2	11	0	Width narrows E of Trillium from 14 to 12', 3-6'pkg by Trillium

Roadway Use and Characteristics (Continued)						
<i>Road Name</i>	<i>Length (miles)</i>	<i>Average Width/ft</i>	<i>Rd Intersections</i>	<i>Houses along route</i>	<i>Turnouts</i>	<i>Comments</i>
Homestead Rd (Highland to Rk Rose)	0.43	20.0	2	5	0	Wide area near curve
Homestead Road (Rk Rose to Quaking A)	0.33	30.0	2	8	2	Access Pool, Lower Meadow, Turnouts at lots #60,#56,approx. 20'x70'
Homestead Road (QA to Bitter B NE end)	0.24	25.0	5	12	0	
Homestead Road (NE BB to Homestead M.)	0.10	20.0	1	3	0	Upper Meadow Path
Laney Lane	0.14	11'	1	5	0	Turn around at end of Road
Lupine Road	0.12	14.5	1	3	0	
Mustard Mt. Road	0.26	12.0	3	9	0	
Quaking Aspen Road	0.80	18.0	2	17	1	At least 1 wide spot in road could be used as turnaround, left after water project
Reservoir Way	0.08	7'	1	0	1	Leads to reservoir, Turnaround near Tank
River Road	0.13	13.2	0	8	0	
Rock Rose Road	0.3	12.0	2	3	0	Rd narrows to 8-10' beyond 3rd house, wide spot by lot 2
Sunflower Lane	0.19	10.0	1	2	0	
Trillium Road (W/Crabapple)	0.46	10.5	3	10	0	narrow rd w parked cars restrict width
Trillium Road (E/Crabapple)	0.21	11	2	8	0	11.5' for first 350' then 10'
West Fawn Road	0.34	12.0	2	4	0	
Wintergreen Road	0.14	10.0	1	3	0	
TOTAL	8.17					

	Road Surface					
Road Name	Crown	Wash-board	Potholes	Loose gravel	Rx in Rd	Comments
Ayer's Court	No	No	over 25%, 1-4"	No	Over 25%	
Bitterbrush Road	< 3"	No	No	Yes	Minor, 4-8"	
Blue Grouse Lane	No	No	No	No	Minor, 2-4"	Width, condition deteriorate closer to reservoir
Cassal Road	No	Yes	Yes	Yes		Washboards > 20' and > 3" deep, soft gravel, potholes 12-4 inches ,5% of rd, Side ditches above rd grade 1st 600', loose gravel, area of steep drop off and narrow width
Cottonwood Road	No	No	No	Yes	Minor, 2-4 and 4-8"	
Crabapple Road	No	10-20'	No	Yes	Minor, 2-4"	bad washboard, 1/2 up from Highland
Drake Dr	No	5-10'	No	Yes	Minor, 2-4"	Lack of surfacing, washboard at Homestead
Eagles Nest Road	No	5-10'	<5%, 1-4"	No	Minor, 2-4"	Lack of surfacing, side rd- 8' width, minor 2-4' rx and 5' washboards
East Fawn Road	No	>20'	>25%,+4"	No	Major, 4-8"	Road in very poor condition
Elderberry Road	No	No	<5%	No	No	
Fawn Road	No	No	<5%	Yes	Minor, 1-4"	
Heather Road	No	No	No	No	No	No gravel, compact dirt
Highland Meadow Road	No	<5%, 1-3"	No	Yes	Occasional	Rx in Road minor, 4-8"
Highland Rd (Ent to Switchback)	Yes, 1-3" Not 100%	1-3"	No	No	No	Washboards at entrance, corners, switchback
Highland Road (SBk to Crabapple)	No	>20', 1-3"+	>25%	No	No	Water project on rd, washboards and seasonal potholes worse W of pump house
Highland Road (Crapple to CattleG.)	Yes, 1-3" Not 100%	No	No	No	No	Surface material OK except in erosion areas

	Road Surface (Continued)					
Road Name	Crown	Wash-board	Potholes	Loose gravel	Rx in Rd	Comments
Homestead Rd (Highland to Rk Rose)	No	Yes	Yes	Yes	Minor, 2-4"	WB extreme and persistent on curve section
Homestead Road (Rk Rose to Quaking A)	No	Yes	No	Yes	No	Surface material appears adequate
Homestead Road (QA to Bitter B NE end)	No	Yes	Yes	Yes	Yes	36' of 2-4" rocks in Rd
Homestead Road (NE BB to Homestead M.)	No	No	No	Yes	No	Surface material appears adequate
Laney Lane	No	No	No	No	No	minimum gravel but appears adequate
Lupine Road	Yes, <3"	No	No	Yes	No	
Mustard Mt. Road	No	Yes	Yes	Yes	Yes	20' WB, 5-25% Potholes, Some 2-4"rx
Quaking Aspen Road	Yes, 3-6"	No	No	No	No	West part of road recently resurfaced, very good shape, Eastern part of road still good but less surfacing
Reservoir Way	No	No	No	No	Y, Major	Significant ruts and rocks in road
River Road	Yes	No	No	Yes	No	Surface material seems adequate
Rock Rose Road	No	Yes	Yes	Yes	Yes	Major WB, Potholes, Rocks in road beyond 3rd house
Sunflower Lane	No	Yes	<5%	No	Yes	Overall surface material lacking, occasional 2-4" rocks WB >20',
Trillium Road (W/Crabapple)	No	Yes	< 5%	No		Lots of loose rk in WB area by Heather/W end (200')
Trillium Road (E/Crabapple)	No	Yes	No	No	Yes	WB uphill from Highland only, Minor 2-4" Rk
West Fawn Road	Yes	Yes	<5%	Yes	Yes	Occasional 2-8" rk, overall surfacing lacking
Wintergreen Road	<3"	Yes	No	No	Yes	Minor WB at E Fawn Crk, minor rutting

Road Name	Drainage/Erosion			Signs				Comments
	# of culverts	Drainage Ditches	Erosion	Dust	Speed	Info	Wooden	
Ayer's Court	0	minimum	Major	0	0	Dead end	1	Erosion in middle of rd, extends to Mustard Mtn.
Bitterbrush Road	0	Present, clogged	Yes	0	0	0	0	Major erosion at E. end, culvert needed at 16 Bitterbrush
Blue Grouse Lane	0	Mostly non-existent	No	0	0	0	0	
Cassal Road	2	Non-existent first 600'	Yes	0	3	0	1	Culverts clogged, erosion first 600'
Cottonwood Road		Mostly non-existent	No	0	0	0	0	
Crabapple Road	0	Present but clogged	Minor	0	0	0	0	Entire rd steep, erosion where ditching inadequate
Drake Dr	0	Mostly non-existent	Minor	1	0	0	0	Wooden dust sign
Eagles Nest Road	0	Mostly non-existent	Major in section	0	0	0	0	channel in rd by Lot 24, 4"-8"rx
East Fawn Road	0	Mostly non-existent	Major	0	1	1, Pvt. Comm.	1	Erosion particularly bad S. of MM and Highland M
Elderberry Road	0	adequate	No	0	0	1, Dead End	1	
Fawn Road	0	Mostly non-existent	No	0	0	1, Dead End	1	
Heather Road	0	None	No	0	0	0	0	
Highland Meadow Road	1	Minimum	Minor	0	0	0	0	Erosion near E. Fawn Rd.
Highland Rd (Ent to Switchback)	2	Adequate	No	0	1	0	0	
Highland Road (SBK to Crabapple)	4	Yes, but clogged	Yes	0	0	0	0	Hard to determine condition due to Water project
Highland Road (Crapple to CattleG.)	0	Yes, but clogged	Minor	0	0	0	0	

Road Name	Drainage/Erosion (Continued)			Signs (Continued)				Comments
	# of culverts	Drainage Ditches	Erosion	Dust	Speed	Info	Wooden	
Homestead Rd (Highland to Rk Rose)	1	Yes, but clogged	No	1	1	1	1	
Homestead Road (Rk Rose to Quaking A)	2	Present but clogged	Minor	1	0	0	0	No drainage at bottom of hill (@#56), erosion near QA
Homestead Road (QA to Bitter B NE end)	7	Present but clogged	None	0	1	0	1	2 culverts not functioning
Homestead Road (NE BB to Homestead M.)	3	Present but clogged	None	0	0	0	0	
Laney Lane	0	None	None	0	0	1	1	Wooden Dead End sign
Lupine Road	0	Mostly non-existent	None	0	0	0	0	
Mustard Mt. Road	0	Mostly non-existent	Major	0	0	Dead end	1	water from Ayers Ct causing erosion in rd
Quaking Aspen Road	0	Mostly non-existent	None	0	0	0	0	
Reservoir Way	0	None	Minor	0	0	0	0	Ruts in road caused by erosion
River Road	0	Mostly non-existent	No	0	0	0	0	
Rock Rose Road	0	Mostly non-existent	Yes	0	0	0	0	Drainage issues by TS house
Sunflower Lane	0	Mostly non-existent	N	0	0	0	0	
Trillium Road (W/Crabapple)	0	Mostly non-existent	No	0	0	0	0	Need sign by Heather about steep grade
Trillium Road (E/Crabapple)	0	Mostly non-existent	Major	0	0	0	0	Erosion for 300' E of Highland
West Fawn Road	0	Mostly non-existent	Major	2	4	0	2	Appears water in rd during high water events
Wintergreen Road	0	Mostly non-existent	Minor	0	0	0	0	
TOTAL								

	Safety				
<i>Road Name</i>	<i>Dust issue</i>	<i>No reflectvie house #</i>	<i>Sight Distance</i>	<i>Vegetation encroachment</i>	<i>Comments</i>
Ayer's Court	No	1	No	Medium	
Bitterbrush Road	Minor	4	No	Medium	Middle section has some canopy issues
Blue Grouse Lane	No	2	No	Medium	
Cassal Road	Minor	7	Yes	Medium	Sight Distance issue at Jankowsky's (11,100 - 1,500' from, east end of Cassal, 2 houses had no numbers, 1 conflicted with county assessor number
Cottonwood Road	No	2	No		Short Road, Low traffic
Crabapple Road	Major	1	No	Medium	
Drake Dr	Minor	1	Yes	Low	Sight distance issue at intersection with Homestead and curve on Drake
Eagles Nest Road	Minor	3	No	Low	
East Fawn Road	Minor	4	No	Low	
Elderberry Road	No	1	No	Medium	
Fawn Road	No	2	1	Medium	
Heather Road	No	N/A	No	Medium	Rd goes to one vacant lot
Highland Meadow Road	No	2	No	Medium	
Highland Rd (Ent to Switchback)	Yes, Major	6	No	Low	
Highland Road (SBk to Crabapple)	Yes, Major	0	Yes	Medium	
Highland Road (Crapple to CattleG.)	Major	7	No	Low	Shoulder minimal, tight to pass except low speeds

Safety (Continued)					
<i>Road Name</i>	<i>Dust issue</i>	<i>No reflectvie house #</i>	<i>Sight Distance</i>	<i>Vegetation encroachment</i>	<i>Comments</i>
Homestead Rd (Highland to Rk Rose)	Major	1	No	Medium	
Homestead Road (Rk Rose to Quaking A)	Major	3	Yes	Medium	Difficult to see traffic on Rock Rose when traveling west
Homestead Road (QA to Bitter B NE end)	Major	4	No	Medium	
Homestead Road (NE BB to Homestead M.)	Major	2	No	Medium	
Laney Lane	No	0	No	Low	
Lupine Road	No	2	No	Medium	Appears to have very low traffic
Mustard Mt. Road	Minor	1	No	Medium	
Quaking Aspen Road	Minor	9	No	Low- Medium	Low vegetation concerns at area recently rehabilitated, some encroachment on E. end
Reservoir Way	Nno	0	No	Medium	
River Road	No	5	No	Medium	
Rock Rose Road	Minor	2	Yes	Medium	Sight distance issue at intersection with Homestead
Sunflower Lane	No	1	No	High	
Trillium Road (W/Crabapple)	Minor	5	Yes	Medium	Sight Distance issue at 130 degree turn by Heather Rd
Trillium Road (E/Crabapple)	Minor	4	No	Medium	Dust can be more concern when traffic higher
West Fawn Road	Major	3	No	Medium	
Wintergreen Road	No	3	No	Medium	
TOTAL					

Appendix B. Dust information

EPA classifies particle pollution as coarse particles, between 2.5 and 10 micrometers, abbreviated as PM10, and as fine particles, 2.5 micrometers in diameter and smaller, called PM2.5. Road dust and some agricultural operations are typical sources of PM10 for Edelweiss residents, whereas woodstoves, engine exhaust, and wildfires are Edelweiss' most likely sources of PM 2.5. Currently, there are no monitors in Edelweiss to measure particle pollution.

EPA has established National Ambient Air Quality Standards (NAAQS) under its Clean Air Act authority for both PM2.5 and PM10. The standard for PM10 is 150 microgram per cubic meter (150 $\mu\text{g}/\text{m}^3$) averaged over 24 hours (not to be exceeded more than once per year averaged over 3 years). The standard for PM2.5 is 35 $\mu\text{g}/\text{m}^3$ averaged over 24 hours, with an annual average not to exceed 12 $\mu\text{g}/\text{m}^3$. The EPA uses the Air Quality Index (AQI) as a tool to translate measurements of air concentrations (NAAQS) into measurements of relative hazard for the public.

The Central Regional Office of the Department of Ecology (Union Gap, WA) is the official air quality monitoring entity for the portion of Washington State that includes Edelweiss. The nearest official air quality measuring station to Edelweiss is located at US Forest Service offices on West Chewuch Rd, Winthrop. It measures PM2.5 (units of air quality index or AQI), visibility (miles), and backscatter (an indication of particulates less than PM2.5). The nearest official measurements of PM10 (like our road dust) are in Colville and Yakima. Washington's PM10 exceedances are most often related to dust storms in the Columbia basin.

In addition to official measurements of air quality, individuals can also take their own measurements, either by grabbing a sample or by continuously monitoring. Grab sampling can be inexpensive and quick, but it is difficult to compare a short-term measurement to an average daily concentration.

Continuous monitoring has the advantage of providing a daily average, but it tends to be more expensive and time consuming than a grab sample. Most non-official measurements tend to lack the scientific rigor required for comparison to NAAQS, but they can be effective in identifying trends and qualitative comparisons.

The Methow Citizens Advisory Council has several continuously operating air quality monitors that are part of the Purple Air network.¹⁷ The Purple Air Network is low cost air quality sensor network providing real time measurement of air quality on a public map. There are at least four purple air monitors in the vicinity of the Edelweiss Community located at: Last Ranch on Highway 20, Gunn Ranch, Mazama Trailhead, and Upper Rendezvous. A single PA-II sensor costs \$229 plus shipping and requires wifi connection to the internet. Purple Air monitors use lasers to count the number and size of particles. They report results as AQI, which is appropriate for determining a relative degree of hazard, but not appropriate to determine compliance with NAAQS without additional and expensive laboratory analysis.

¹⁷ <https://www2.purpleair.com>

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