

Appendix A

Trail Maintenance Standards

The Trail Maintenance Standards are the physical measurements and types of material required for trail surface maintenance of the Fairfax County Park Authority trails. Each Trail Maintenance Standard is the culmination of Park Authority maintenance based needs, and are adapted from the Fairfax County Public Facility Manual (PFM). The following Trail Maintenance Standards apply to the types of trails addressed within the Guide to Trail Management.

Considerations reflected in the Trail Maintenance Standards:

- Trail maintenance is performed by Park Authority staff.
- Capital equipment needs are listed for each standard. Non-capital equipment needs are not listed, and will be determined by the manager on site.
- The stated vehicles, equipment, methods, and volumes and weight for material pertain only to the completion of the task at site. Vehicles, equipment, methods, and materials do NOT include transport of materials to or from the site at which the task is performed.
- Calculations for man hours and weight are based upon “Ideal” or “Fair Weather” conditions. Humidity, extreme temperatures, wind, extreme grade changes, winding curves, mixing of cement, or the condition of equipment are NOT factored into any calculations.
- Volume and weight calculations used standards for asphalt and aggregate are from the Virginia Asphalt Association, Richmond, VA; and Chantilly Crushed Stone, Inc., Chantilly, VA. Asphalt equivalence is 1 cubic yard = 2.025 tons; VA21-A and Bluestone Dust equivalence is 1 cubic yard = 2 tons; Surge (4” x 6”) and VA57 equivalence is 1 cubic yard = 1.5 tons.
- Volume and weight calculations for fill dirt used in the standards are based upon information furnished by William A. Hazel, Inc, Chantilly, VA; Hilltop Construction, Demolition and Landfill Company, Alexandria, VA; and the Falls Church Construction Company, Fairfax, VA. Fill dirt is to be absent of organic matter, and can vary as to percentages of sand and clay. (The weight of fill dirt can also vary greatly depending upon the moisture content resulting in a cubic yard weighing from 1.5 tons to 5 tons.) The equivalency frequently used in the construction industry is 1 cubic yard = 3 tons of fill dirt.

Abbreviations used are as follows:

- a. Cubic feet = cu. ft.
- b. Cubic yards = cu. yd.
- c. Hours = hr.
- d. Linear feet = l. ft.
- e. Square feet = sq. ft.



ASPHALT TRAILS – AVERAGE WIDTH OF 8 FT. (per 1,000 linear feet)

Pot Holes	
Maintenance Task	Patch & repair pot holes (12" x 12"). <i>(Based upon 5% trail deterioration per 1000' per year, this =s 400 sq. ft. or 50 l. ft.)</i>
Frequency	Patch & repair 4.0 sq. ft. (100 pot holes 12" x 12" = 1.0 sq. ft. enlarged to 24" x 24" = 4.0 sq. ft.) Annually or As needed.
Standard	.5 hr. per 4.0 sq. ft. pot hole (or 50 hrs. per 400 sq. ft.).
Staff Hours	<u>Laborer</u> .5 hr. Total .5 hr.
Materials	<p><i>Note: Standards were developed with base material and asphalt topping consisting of:</i></p> <ol style="list-style-type: none"> 1. 2" asphalt surface 2. 4" 21-A base <p><u>Asphalt</u> 4.0 sq. ft. 24" x 24" x 2" = 1152 cu. in. (.67cu. ft. or .05 tons) of asphalt. 67 cu. ft. (or 5 tons) of asphalt per year.</p> <p><u>Stone</u> 4.0 sq. ft. 24" x 24" x 4" = 2304 cu. in. (1.33 cu. Ft. or .096 tons) of stone. 133 cu. ft. (or 9.6 tons) of stone per year.</p>
Method	<p>Remove old asphalt/debris.</p> <p>Enlarge edges an additional 6" on all four sides, and square asphalt edges of hole.</p> <p>Replace base stone and compress to grade as needed to meet PFM standard.</p> <p>Replace asphalt and compress even with trail surface.</p>
Capital Equipment	Roller may not be required for Pot Hole repairs; hand tamper or vibrator are adequate.



ASPHALT TRAILS – AVERAGE WIDTH OF 8 FT. (per 1,000 linear feet)

Small Section	
Maintenance Task	Replacing small section of trail (1' x 8'). <i>(Based upon 5% trail deterioration per 1000' per year, this =s 400 sq. ft. or 50 l. ft.)</i>
Frequency	Repair 16 sq. ft. section (25 sections 1' x 8' = 8.0 sq. ft. enlarged to 2' x 8' = 16 sq. ft.) Annually or As needed.
Standard	1.0 hrs. per 16 sq. ft. (or 25 hrs. per 400 sq. ft.).
Staff Hours	Equipment Operator 1.0 hr. Laborer 1.0 hr. <u>Laborer 1.0 hr.</u> Total 3.0 hrs.
Materials	<p><i>Note: Standards were developed with base material and asphalt topping consisting of::</i></p> <ol style="list-style-type: none"> 1. 2" asphalt surface 2. 4" 21-A <p><u>Asphalt</u> 16 sq. ft. 2' x 8' x 2" = 4608 cu. in. (2.67 cu. ft. or .20 tons) of asphalt. 66.75 cu. ft. (or 5.0 tons) of asphalt per year.</p> <p><u>Stone</u> 16 sq. ft. 2' x 8' x 4" = 9216 cu. in. (5.33 cu. ft. or .384 tons) + 2 sq. ft. 12' x 24" x 6" = 1728 cu. in. (1.00 cu. ft. or .048 tons) equals 10944 cu. in. (6.33 cu. ft. or .432 tons) of stone. Total of 158.33 cu. ft. (or 10.80 tons) of stone per year.</p>
Method	Remove old asphalt/debris. Square asphalt edges of hole. Replace base and compress to grade as needed to meet PFM standard. Replace asphalt and compress even with trail surface.
Capital Equipment	Dump Truck Roller may not be required for Small section repairs; hand tamper or vibrator are adequate.

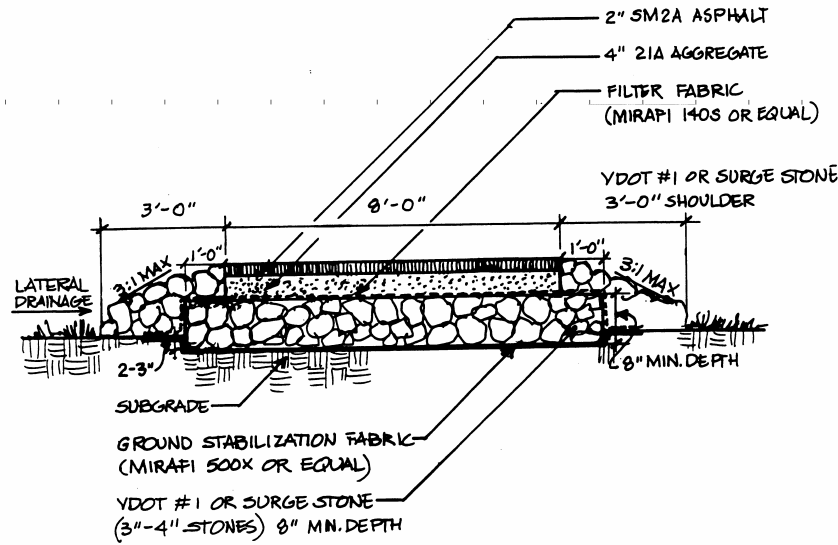
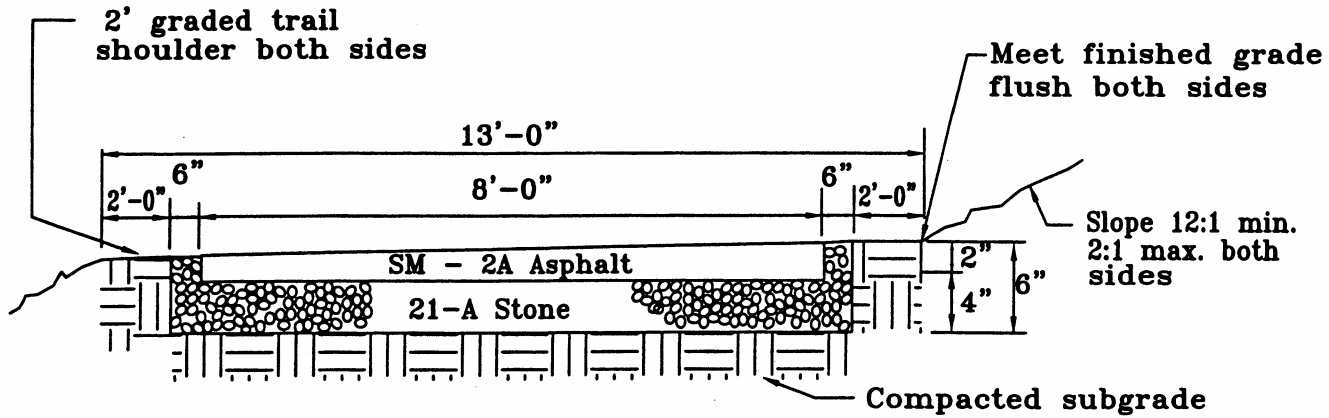


ASPHALT TRAILS – AVERAGE WIDTH OF 8 FT. (per 1,000 linear feet)

Large Section	
Maintenance Task	Replacing large section of trail (8' x 50'). <i>(Based upon 5% trail deterioration per 1000' per year, this =s 400 sq. ft. or 50 l. ft.)</i>
Frequency	Replace 400 sq. ft. section. Annually
Standard	.5 hr per 400 sq. ft. . (or .5 hrs. per 400 sq. ft.).
Staff Hours	Equipment Operator .5 hr. Equipment Operator .5 hr. Laborer .5 hr. <u>Laborer .5 hr.</u> Total 2.0 hrs.
Materials	<p><i>Note: Standards were developed with base material and asphalt topping consisting of::</i></p> <ol style="list-style-type: none"> 1. 2" asphalt surface 2. 4" 21-A <p><u>Asphalt</u> 400 sq. ft. 8' x 50' x 2" = 115200 cu. in. (66.66 cu. ft. or 5 tons) of asphalt. 66.66 cu. ft. (or 5 tons) of asphalt per year.</p> <p><u>Stone</u> 400 sq. ft. 8' x 50' x 4" = 230400 cu. in. (133.33 cu. ft. or 9.6 tons) + 50 sq. ft. 50' x 12" x 6" = 43200 cu. in. (25 cu. ft. or 1.2 tons) equals 273600 cu. in. (158.33 cu. ft. or 10.8 tons) of stone per year.</p>
Method	Remove old asphalt/debris. Square asphalt edges of hole. Replace base and compress to grade as needed to meet standard. Replace asphalt and compress even with trail surface.
Capital Equipment	Bucket Loader York Rake Dump Truck Roller



Asphalt Trail Details – Average Width 8' / 1000' LF



Asphalt Wet Trails - Average Width 8' / 1000 LF

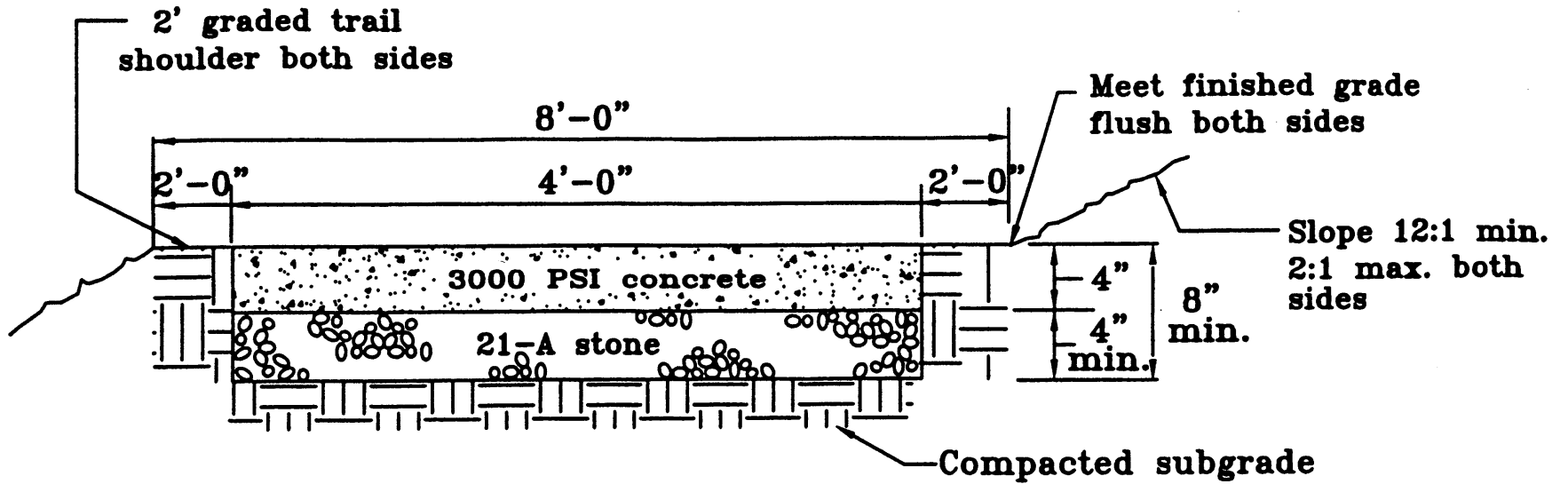


CONCRETE TRAILS – AVERAGE WIDTH OF 4 FT. (per 1,000 linear feet)

Small Section	
Maintenance Task	Replacing small section of trail (4' x 4'). <i>(Based upon .4% trail deterioration per 1000' per year, this =s 16 sq. ft. or 4.0 l. ft.)</i>
Frequency	Repair 16 sq. ft. section (1 section 4' x 4' = 16 .0 sq., ft.) Annually or As needed.
Standard	2.01 hrs. per 16 sq. ft. (or 2.01 hrs. per 16 sq. ft.)
Staff Hours	Supervisor 2.01 hr. Laborer 2.01 hr. <u>Laborer 2.01 hr.</u> Total 6.03 hrs.
Materials	<p><i>Note: Standards were developed with base material and asphalt topping consisting of::</i></p> <ol style="list-style-type: none"> 1. 4" Concrete 2. 4" 21-A <p><u>Concrete</u> 16 sq. ft. 4' x 4' x 4" = 9216 cu. in. (5.33 cu. ft. or .197 cu. yd.) of concrete. 5.33 cu. ft. (or .197 cu. yd.) of concrete per year.</p> <p><u>Stone</u> 16 sq. ft. 4' x 4' x 4" = 9216 cu. in. (5.33 cu. ft. or .384 tons). Total of 5.33 cu. ft. (or .384 tons) of stone per year.</p> <p><u>Wood</u> 5.3 cu. ft. wood form material.</p>
Method	<p>Remove old concrete/debris. Square edges of hole. Replace base and compress to grade as needed to meet PFM standard. Install wood form and anchor into place. Pour cement. Even surface of cement with float. Cover surface with plastic until dry. Carefully remove form. Clean up any excess cement and debris.</p>
Capital Equipment	<p>Pickup Truck Roller may not be required for Small section repairs; hand tamper or vibrator are adequate.</p>



Concrete Trail – Average Width 4’/1,000 LF



GRAVEL TRAILS – AVERAGE WIDTH OF 8 FT. (per 1,000 linear feet)

Pot hole repair	
Maintenance Task	Repair pot holes (12" x 12") of gravel trail. <i>(Based upon a 20% deterioration rate per 1000' per year, this = 's 1600 sq. ft. or 200 l. ft.)</i>
Frequency	Repair 4.0 sq. ft. (400 pot holes 12" x 12' = 4 sq. ft. enlarged to 24" x 24' = 4 sq. ft.). Annually (or As needed)
Standard	.50 hr. per 4.0 sq. ft = 12" x 12" pot hole (or 150 hrs. per 1200 sq. ft.).
Staff Hours	Equipment Operator .50 hr. Laborer .50 hr. Total .50 hrs.
Materials	<p><i>Note: Standards were developed with base material and Bluestone Dust topping consisting of:</i></p> <ol style="list-style-type: none"> 1. 2" Bluestone Dust 2. 4" 21-A base <p><u>Bluestone Dust</u> 4.0 sq. ft. 24" x 24" x 2" = 1152 cu. in. (.67 cu ft. or .048 tons) of Bluestone Dust. 268 cu. ft (or 19.2 tons) of Bluestone Dust per year.</p> <p><u>Gravel</u> 4.0 sq. ft. 24" x 24" x 4" = 2304 cu. in. (1.34 cu ft. or .096 tons) of 21 – A gravel. 536 cu. ft (or 38.4 tons) of 21 – A gravel per year.</p>
Method	<p>Remove old dust and gravel/debris. Square edges of hole. Even out surface and compact. Replace base stone and compress to grade as needed to meet PFM standard. Replace dust and compress even with trail surface.</p>
Capital Equipment	<p>Dump Truck Roller may not be required for Pot Hole repairs; hand tamper or vibrator are adequate.</p>



GRAVEL TRAILS – AVERAGE WIDTH OF 8 FT. (per 1,000 linear feet)

Small section repair	
Maintenance Task	Repair small area (1' x 8') of gravel trail. <i>(Based upon a 20% deterioration rate per 1000' per year, this =s 1600 sq. ft. or 200 l. ft.)</i>
Frequency	Repair 8.0 sq. ft. (400 small sections 1' x 8' x 2" = 8 sq. ft.). Annually (or As needed)
Standard	1.00 hr. per 8.0 sq. ft = 1' x 8' small section (or 200 hrs. per 1600 sq. ft.).
Staff Hours	Equipment Operator 1.00 hr. Laborer 1.00 hr. <u>Laborer 1.00 hr.</u> Total 3.00 hrs.
Materials	<p><i>Note: Standards were developed with base material and stone topping consisting of:</i></p> <ol style="list-style-type: none"> 1. 2" Bluestone Dust 2. 4" 21-A base <p><u>Bluestone Dust</u> 8.0 sq. ft or 1' x 8' x 2" section (1.33 cu. ft. or .096 tons) of Bluestone Dust. 266 cu. ft. (or 19.2 tons) of Bluestone Dust per year.</p> <p><u>Gravel</u> 8.0 sq. ft. or 1' x 8' x 4" section (2.66 cu. ft. or .192 tons) of 21-A. 532 cu. ft. (or 38.4 tons) of 21-A gravel per year.</p>
Method	Remove old dust and gravel/debris. Even out dirt surface and compress. Replace base stone and compress to grade as needed to meet PFM standard. Replace dust and compress even with trail surface.
Capital Equipment	Dump Truck Bucket Loader Roller may not be required for Small section repairs; hand tamper or vibrator are adequate. Tractor York Rake implement

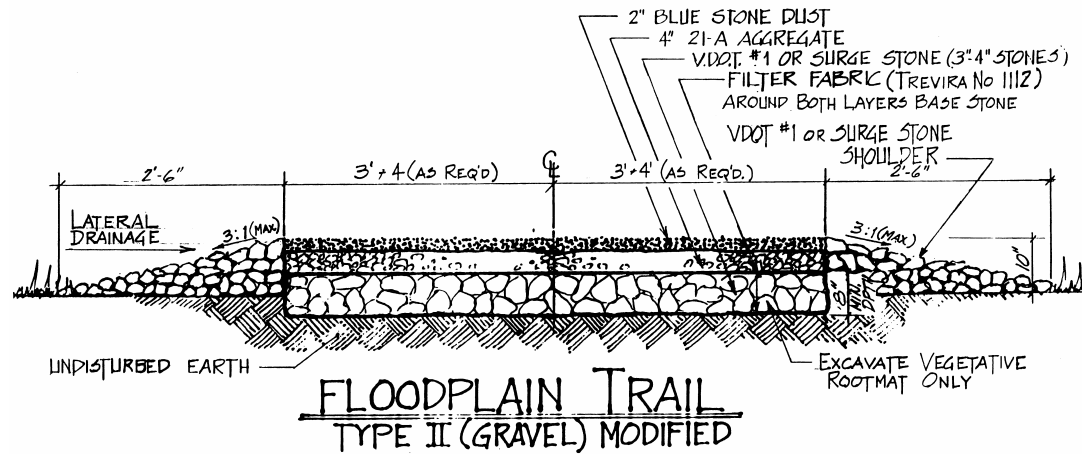
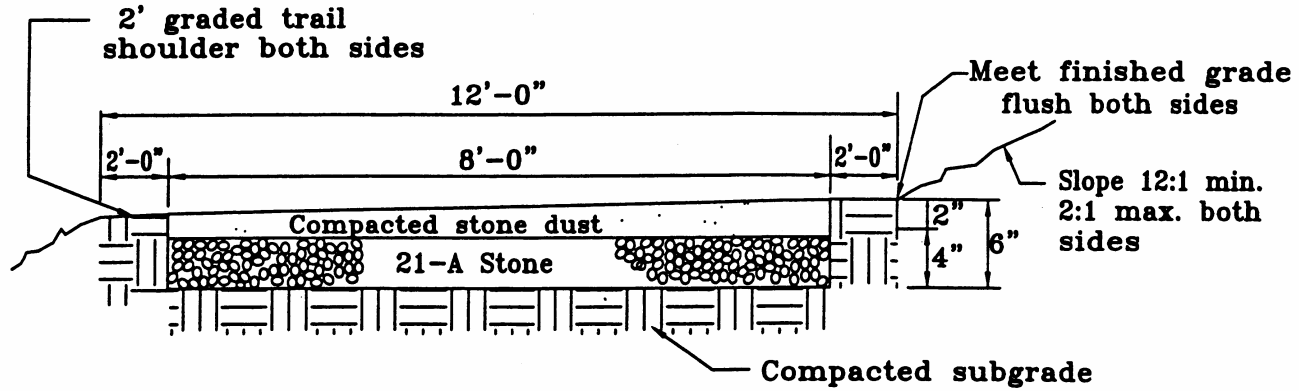


GRAVEL TRAILS – AVERAGE WIDTH OF 8 FT. (per 1,000 linear feet)

Maintenance Task	Resurfacing top 1" of trail per 1000'
Frequency	Annually
Standard	1.0 hrs. per 1000'
Staff Hours	Equipment Operator 1.0 hr. Equipment Operator 1.0 hr. Laborer .25 hr <u>Laborer 1.0 hr.</u> Total 3.25 hrs.
Materials	48 tons of Bluestone Dust (8' x 1000' x 1")
Method	Dump Truck spread Machine grade Compact
Capital Equipment	Dump truck, Bucket Loader, York Rake, Roller



Gravel Trail Details – Average Width 8' / 1,000' LF



Gravel Wet Trails - Average Width 8' / 1000 LF



NATURAL TRAILS – AVERAGE WIDTH OF 6 FT. (per 1,000 linear feet)

Small Section Repair	
Maintenance Task	Replacing small section of trail (1' x 6'). <i>(Based upon 5% trail deterioration per 1000' per year, this =s 300 sq. ft. or 50 l. ft.)</i>
Frequency	Repair 6 sq. ft. section (50 sections 1' x 6' = 6.0 sq. ft.) Annually or As needed
Standard	.25 hr. per 6 sq. ft. (or 12.50 hr. per 300 sq. ft.)
Staff Hours	Equipment Operator .25 hr. Laborer .25 hr. Total .50 hrs.
Materials	<i>Note: Standards were developed with a 2" topping of fill dirt, laid over compacted natural dirt surface.</i> <u>Fill dirt</u> 1.0 cu. ft. per 1. ft. (1' x 6') .111 tons 6 sq. ft. 1' x 6' x 2" = 1728 cu. in. (1.0 cu. ft. or .111 tons) of fill dirt. 50.0 cu. ft. (or 5.55 tons) of fill dirt per year. <i>(Fill any missing base using 1' x 1' x 2" = .0185 tons of fill dirt as a reference.)</i>
Method	Remove old dirt/debris to solid ground Fill surface depth of 2" with new dirt. Even out surface Compact even with trail surface.
Capital Equipment	Dump truck Roller may not be required for Small section repairs; hand tamper or vibrator are adequate.

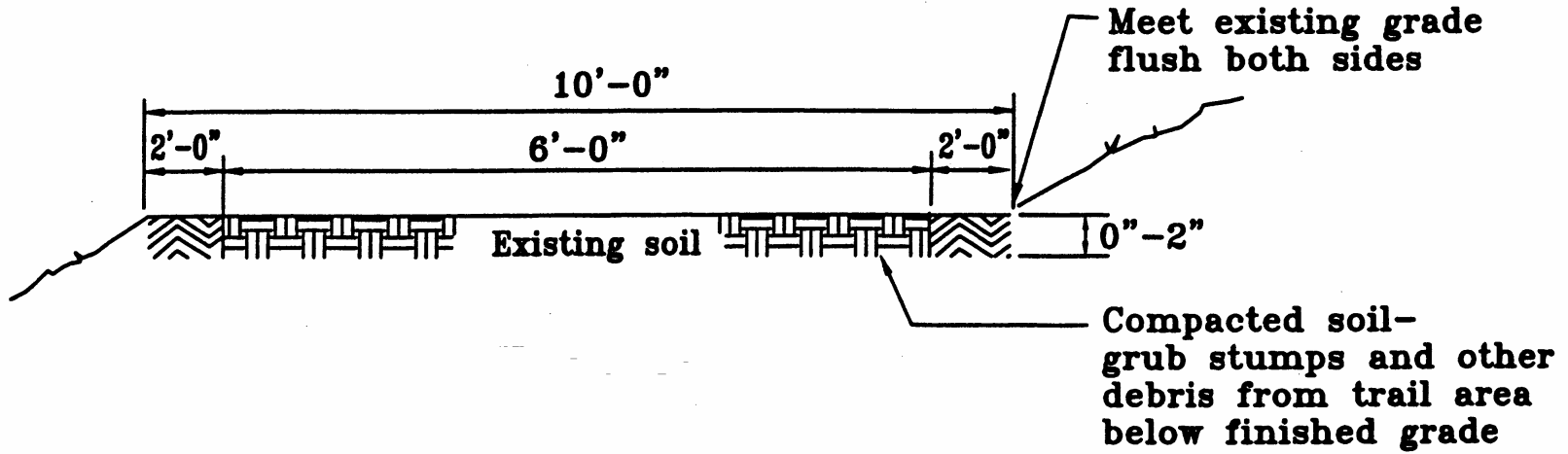


NATURAL TRAILS – AVERAGE WIDTH OF 6 FT. (per 1,000 linear feet)

Large Section Repair	
Maintenance Task	Replacing large section of trail (50' x 6'). <i>(Based upon 5% trail deterioration per 1000' per year, this =s 300 sq. ft. or 50 l. ft.)</i>
Frequency	Replace 300 sq. ft. Annually
Standard	.50 hr. per 300 sq. ft.
Staff Hours	Equipment Operator .50 hr. Laborer .50 hr. <u>Laborer .50 hr.</u> Total 1.50 hrs.
Materials	<p><i>Note: Standards were developed with a 2" topping of fill dirt, laid over compacted natural dirt surface.</i></p> <p><u>Fill dirt</u> 300 sq. ft. 6' x 50' x 2" = 86400 cu. in. (50.00 cu. ft. or 5.55 tons) of fill dirt per year. <i>(Fill any missing base using 1' x 1' x 2" = .0185 tons of fill dirt as a reference.)</i></p>
Method	Remove old dirt/debris to solid ground Spread with Dump truck Even out surface Compact to final grade of trail
Capital Equipment	Dump truck York Rake Tractor Roller



Natural Trails Detail – Average Width 6' / 1,000' LF



WOOD CHIP TRAILS – AVERAGE WIDTH OF 8 FT. (per 1,000 linear feet)

Small section repair	
Maintenance Task	Repair small area (1' x 8') of wood chip trail. <i>(Based upon a 40% deterioration rate per 1000' per year, this = 's 3200 sq. ft. or 400 l. ft.)</i>
Frequency	Repair 8.0 sq. ft. <i>(400 small sections 1' x 8' x 2" = 8 sq. ft.)</i> . Annually (or As needed)
Standard	1.00 hr. per 8.0 sq. ft = 1' x 8' small section (or 200 hrs. per 1600 sq. ft.).
Staff Hours	Equipment Operator .25 hr. Laborer .25 hr. Total .50 hrs.
Materials	<p><i>Note: Standards were developed with materials consisting of:</i></p> <ol style="list-style-type: none"> 1. 3" Wood Chips 2. 4" 21-A base <p><u>Wood Chips</u> 8.0 sq. ft or 1' x 8' x 3" section (2.0 cu. ft. or .074 cu. yd.) of Wood Chips. 800 cu. ft. (or 29.63 cu. yd.) of Wood Chips per year.</p> <p><u>Gravel</u> 8.0 sq. ft. or 1' x 8' x 4" section (2.66 cu. ft. or .192 tons) of 21-A. 1064 cu. ft. (or 76.8 tons) of 21-A gravel per year.</p>
Method	<p>Remove old wood chips and gravel/debris. Even out dirt surface and compress. Replace base stone and compress to grade as needed to meet PFM standard. Replace wood chips and rake even with trail surface.</p>
Capital Equipment	<p>Dump Truck Roller may not be required for Small section repairs; hand tamper or vibrator are adequate.</p>



WOOD CHIP TRAILS – AVERAGE WIDTH OF 8 FT. (per 1,000 linear feet)

Large section repair	
Maintenance Task	Repair small area (50' x 8') of wood chip l trail. <i>(Based upon a 40% deterioration rate per 1000' per year, this = 's 3200 sq. ft. or 400 l. ft.)</i>
Frequency	Repair 400 sq. ft. (8 large sections 50' x 8' x 3" = 400 sq. ft.). Annually (or As needed)
Standard	.75 hr. per 400 sq. ft = 50' x 8' large section (or 6 hrs. per 3200 sq. ft.).
Staff Hours	Equipment Operator .75 hr. Equipment Operator .75 hr. Laborer .75 hr. Total 2.25hrs.
Materials	<p><i>Note: Standards were developed with materials consisting of:</i></p> <ol style="list-style-type: none"> 1. 3" Wood Chips 2. 4" 21-A base <p><u>Wood Chips</u> 8.0 sq. ft or 50' x 8' x 3" section (100 cu. ft. or 3.70 cu. yd.) of Wood Chips. 800 cu. ft. (or 29.60 cu. yd.) of Wood Chips per year.</p> <p><u>Gravel</u> 8.0 sq. ft. or 1' x 8' x 4" section (2.66 cu. ft. or .192 tons) of 21-A. 1064 cu. ft. (or 76.8 tons) of 21-A gravel per year.</p>
Method	<p>Remove old wood chips and gravel/debris. Even out dirt surface and compress. Replace base stone and compress to grade as needed to meet PFM standard. Replace wood chips and rake even with trail surface.</p>
Capital Equipment	<p>Dump Truck Bucket Loader Roller Tractor York Rake implement</p>



WOOD CHIP TRAILS – AVERAGE WIDTH OF 8 FT. (per 1000 linear feet)

