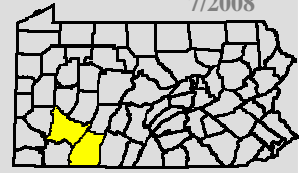


Worksite in Focus

Linn Run Road Somerset / Westmoreland County

7/2008



Project Overview:

Linn Run Road is a relatively high use Forestry road that provides access to several recreational areas in the Laurel Summit area of Westmoreland and Somerset Counties. The road had been paved in the past and was beginning to breakup severely. The Bureau of Forestry was faced with an important decision: pay for the expense of repaving the road and future asphalt maintenance, or revert it back to an unpaved road.

The Plan:

The Bureau decided to reclaim the road using the Dirt and Gravel Road Program. Because of the relatively thin layer of broken asphalt, Linn Run Road was an ideal candidate for a Full Depth Reclamation. This process grinds up the asphalt and mixes it with the road base (and sometimes added material) to create an unpaved road. This is a highly effective method to recycle the existing road material to create a stable unpaved road.

The Reality:

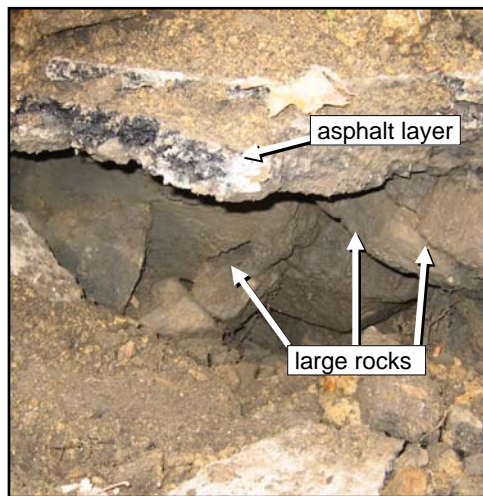
Before beginning a Full Depth Reclamation, it is ALWAYS advisable to take "road core" samples or otherwise examine the road sub-base. This will identify any potential problems, and determine if material will need to be added. In the case of Linn Run Road, the examination of the road sub-base exposed a potential catastrophe in the making. Just a few inches under the asphalt were large (2-3 foot diameter) sandstone boulders (see image below). These shallow boulders, most likely used to build the road on a saturated base, could have caused damage to the road reclaimer and left the road looking like the surface of Mars.

*This demonstration project was funded through the
Dirt and Gravel Road Maintenance Program by...*



asphalt

The existing "tar and chip" road is failing. This section of road will be converted to gravel.



asphalt layer

large rocks

Investigation of road sub-base exposed large boulders preventing a full depth reclamation.

Project Facts

Project: Linn Run Road
Project Owner: PA Forestry: Forbes
Watershed: Linn Run / Loyalhanna Crk
Project Length: 4,700 feet
Date Completed: Drainage '07; Road '08

Cost Summary:

Drainage: \$20,000
Included installation of several new crosspipes and 4,300 feet of constructed stone underdrain

Base Preparation: \$28,000
Included ripping and crushing of existing asphalt, 1,700 tons of 2A road base, and 4,000 feet of separation fabric

DSA: \$45,000
Paver placement and roller compaction for 4,700' x 16' of Driving Surface Aggregate, placed at a depth of 6" and compacted to 4½ inches.

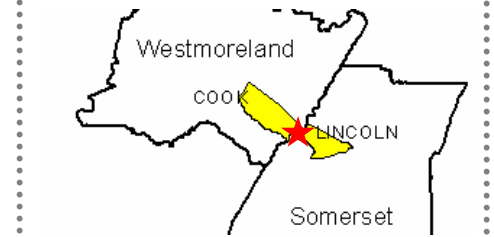
Equipment Rental: \$6,000
Included dozer / ripper and excavator for drainage work.

Total: \$99,000

In-Kind: \$40,000 (estimated)
The PA Bureau of Forestry contributed in kind services including all labor and several pieces of equipment.

For More Information:

Center for Dirt and Gravel Road Studies
(814) 865-5355 www.dirtandgravelroads.org
Forbes State Forest: (724) 238-1200



Latitude: 40.118°N Longitude: 79.181°W

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A Modified Solution:

Because the existing road consisted of asphalt placed almost directly over large boulders, a full depth reclamation, described to the right, was not possible. In order to provide the cover needed over the roadbed of boulders, additional material would need to be imported. A bulldozer equipped with a “3-prong ripper” was used to break up the asphalt. In some cases, a simple carbide tipped grader blade can be used to break up the existing surface. The equipment needed depends on pavement thickness, pavement condition, and road base composition. A layer of 2A aggregate was mixed into the broken pavement to prevent it from “reconstituting” into an asphalt layer. Because of wet site conditions, a layer of separation fabric was placed over this new road sub-base. The fabric was covered by a ~6” base layer of 2A aggregate which was placed at optimum moisture, shaped, and compacted. Driving Surface Aggregate (DSA) was placed onto the 2A base using a paver at an uncompacted depth of 6”, and compacted to 4½”. This process resulted in a gravel road that is sufficiently elevated over the boulders buried under the road. The new road can now be easily maintained as an unpaved road by the Bureau of Forestry with existing equipment. In some cases, an unpaved road surface can be made by simply mixing small amounts of aggregate or stabilizer with the broken road (no DSA). A process called a “mini-stabilization”. This was not an option on Linn Run Road because of the shallow boulders. More information is available about DSA at www.dirtandgravelroads.org under Resources: Driving Surface Aggregate.



Rip-up Asphalt Surface

Instead of a road reclaimer, a “3-prong ripper” on a bulldozer was used to break up the existing layer of asphalt. The base was disturbed to a depth of 6 inches and incorporated into the broken asphalt.



Break-up Asphalt Surface

Repeated passes insured complete breakup of asphalt due not only to the ripper, but to the weight and “tracking” action of the equipment. Lower ambient temperatures help during asphalt break-up.



Add 2A Aggregate

In order to prevent the pieces of broken up asphalt from “reconstituting” an asphalt layer, 2A fill material was tailgated and mixed into the road base using a grader.



Separation Fabric

Fabric was placed over the new roadbed in order to separate it from the new base and aggregate to come, and to provide structural support to the road.

Full Depth Reclamation:

A full depth reclamation, which was planned for the road, involves the use of a Road Reclaimer, pictured to the right, which grinds asphalt into usable aggregate using a spinning drum with carbide-tipped teeth, pictured to the far right. In this process, the Road Reclaimer is used to grind up the asphalt, and to mix in any additional material or stabilizers. Material may be added to the road in order to achieve the most durable road aggregate. The type and amount of additional material is determined by examining core samples of the road. The final shape of the road is then achieved using a motor-grader.



*These two photos are NOT from Linn Run Road. Photos courtesy: Cutting Edge Reclamation, LLC



Road Base Placement

6 inches of 2A fill material, delivered at optimum moisture, was placed on top of the separation fabric. This material serves as a cap to the roadbed and insures that the fabric is sufficiently buried.



Road Base Compaction

The base is shaped and crowned by a grader. Compaction of the road base is critical. Any deformations from settling that occur in the road base will be reflected in the surface aggregate.



Driving Surface Aggregate

Approximately 4,700 linear feet of Driving Surface Aggregate was placed on the road using a paver. The photo above shows DSA placement through an intersection.



Compaction

Compaction of DSA delivered at optimum moisture will achieve the maximum road density to resist traffic and erosion. The photo above shows the edge of DSA placement at a "Y" intersection.

Water, Water, Everywhere...even on a mountaintop at 2,700 feet:

While the main focus of the Linn Run Road project was on a road surface rehabilitation, a significant amount of work was done to address drainage concerns around the road. The photo to the right illustrates the existing condition on much of the project site. Consistently wet ditches meant that driving off the road surface could get you stuck. The large quantities of water in this relatively flat area also made ideal conditions for rutting, potholes, and other deformations resulting from a saturated road base. While road surface improvements are the most visible component of this project, the drainage improvements will help to insure that the new road surface will last as long as possible.

It may seem strange to have water table issues near the top of a mountain at an elevation of over 2,700 feet. Excavations done to install crosspipes revealed the answer. Approximately 6 inches below the surface of the ground was a thick layer of dense clay. This impermeable clay layer served as an aquatard, preventing drainage and keeping the surface saturated. This aquatard is most likely why large sandstone boulders were used to build up the sub-base of the road.



Much of the existing road was saturated for extended periods of time due to an impermeable clay layer.

Drainage Work:

While several new crosspipes were added to Linn Run Road, most of the drainage work concentrated on underdrain. Because much of the road was saturated as pictured above, over 4,000 feet of constructed underdrain was used on the site, largely under the parallel ditch line. The underdrain collects sub-surface and standing surface water and transports it to a stable outlet. When possible, clean underdrain water is outletted separate from ditch drainage. In most cases, the underdrain is buried 6-12 inches below the surface. On Linn Run Road, this was not possible because the clay-heavy soil actually sealed the underdrain and prevented it from draining standing surface water. For this reason, the underdrain was covered with free-draining stone that was left exposed in the ditch in several locations. For more information, two technical bulletins are available on underdrains at www.dirtandgravelroads.org under Resources: Technical Bulletins.



Over 4,000 feet of constructed underdrain were installed on Linn Run Road. The images above show how the underdrain is made using a 4" perforated plastic pipe, surrounded by free-draining stone, wrapped in separation fabric.