

**Amendment for
Six Mile Run, Sandy Run and Longs Run
Restoration Plan Update
Broad Top Township, Bedford County, PA, 2004**

Amendment completed March 2007

Reason for Amendment

The Watershed Implementation Plan for Six Mile Run and Longs Run has been amended. There are several reasons for this action. First is that the majority of the original priority discharges have been addressed in which property owner permission could be attained. The second reason for this update is the need to meet the TMDL required reductions. Even after treatment of the priority discharges TMDL required load reductions are not being met. This is explained in more detail later. This is true because of two reasons. First is that treatment of the original priorities are not removing enough of the pollutants required in the TMDL. Second is that many AMD discharges in this region can't be located. An example would be seepage under the streambed. Therefore it is important to treat as many of the known discharges as possible in order to meet the TMDL required reductions and to restore the watershed.

Recommendations/Priorities

The Six Mile, Sandy, and Longs Run watersheds have been impacted by AMD for many years. Remediation of some of these discharges and additional discharges based on economic feasibility and improved conditions as outlined in the 2001 Restoration plan will help Broad Top Township realize its goals to restore water quality in the area. Continued chemical sampling of the discharges and chemical and biological sampling of stream aquatic habitat is planned to gauge the effects of current and future remedial actions on water quality. In addition, the Township's continued implementation of the Act 537 Sewage Plan by completing construction of new community sewage systems and repair and management of on-lot septic systems will deal with sewage pollution in the watersheds.

Original Priority AMD Remediation Projects

Priority sites were selected by Broad Top Township with advice from their consultant, Skelly and Loy. Factors considered included economic feasibility, landowner cooperation, and overall expected water quality improvement provided by passive treatment. Priority discharges for remediation are those that have potential to provide the greatest improvement at the least cost with immediate opportunities for design and construction. Treatment of smaller discharges at the headwaters of a tributary may be appropriate before treatment of a larger discharge near the mouth of that tributary, because treatment of the headwaters discharge has the potential to restore more miles of stream, especially if several other discharges are located upstream on the main stem.

Costs and type of passive treatment system for each discharge were based on the experience of the Township's consultant, Skelly and Loy. Rough costs of treatment were based on type of system, tons of limestone needed, and associated settling ponds and wetland areas needed. A system life of 25 years was assumed. Estimated long-term operation and maintenance costs were estimated to be 60% of construction costs.

| TABLE 7: Original Priority Discharges for Remediation 2004 through 2010 | | | |
|---|------------------------------------|--|---|
| Priority Discharges | Estimated Construction Cost | Potential Stream Miles Improved | Other factors/ Comments |
| A. Longs Run LR0-D3, 4, 5, 6, 7, 9 LR0-D1, D2, D10, D11, D12, D13, D14, and D15 | \$330,000 | 4.0 miles | Growing Greener funding was secured to treat LR0-D3 to D9. Section 319 funds were received to treat the remaining discharges. These projects should result in full restoration of the Longs Run watershed from AMD impacts. |
| B. Six Mile Run SX3-D1, D2, and D3 | \$243,000 | 0.4 miles | SX3-D1 is the largest flowing discharge along Shreves Run. In combination with SX3-D2 and D3, treatment will reduce aluminum and acidity loadings in the headwaters of Six Mile Run. Grants were secured for remediation. |
| C. Six Mile Run SX8A-D1 and D2 SX2-D1, D2, D3, D4, D5, D6, D7, D8, D9 SX2B-D1, D2 | \$214,000 | 2.1 miles 1.3 miles 1.1 miles | Headwater discharges along Brewster Hollow. Headwater discharges along Six Mile Run locally known as the Spruce Hill area. Discharges along Wisdom Hollow, in the headwaters of Six Mile Run. |
| D. Six Mile Run SX0-D1 and D2 | \$271,000 | 1.1 miles | Headwater discharges along Six Mile Run. |
| E. Six Mile Run Relocation of SX0-D8 | \$10,000 | Not applicable | Treatment is costly due to location near houses and other building structures. Relocation of the discharge will help prevent spread of the discharge across residential and public properties. |

Construction of passive treatment systems to remediate all discharges in the three watersheds was estimated at \$6,680,000, with approximately \$3,150,000 needed to remediate AMDs within the Six Mile Run watershed, \$3,060,000 needed for Sandy Run and approximately \$470,000 needed to restore Longs Run. Costs to treat individual discharges ranged from \$288,000 to \$1,312,000. With additional operation, maintenance and replacement costs estimated at 60% of construction, the grand total for construction and O, M, & R was approximately \$10,680,000.

Several primary discharges identified in Table 4 (located in original watershed implementation plan), including SA0-D14, SA0-D17, SX0-D8 and SX10-D2, were not listed as priority AMD remediation projects in Table 7, due to high associated treatment costs, comparatively lower anticipated overall water quality improvement, and potentially fewer restored stream miles. Other problems associated with these projects included location within the watershed, proximity to residences, availability of space, or

limitations of passive treatment systems. Once the priority projects on Six Mile Run and Longs Run were completed, the restoration plan was to be updated to consider how to address these problem discharges. It is now time for that update to the watershed implementation plan.

Status of Original Priority Treatment Systems

Longs Run

Construction of AMD treatment systems has now been completed for all of the known discharges for which landowner approval has been given (LR0-D2 to LR0-D11, LR0-D13/D15 and LR0-D14). Growing Greener funded \$140,079 towards the remediation, and the township received another \$227,619 from the 319 Nonpoint Source Program. At Station #63, the mouth of Longs Run, TMDL load reductions needed were iron 5.6 tons/year, manganese 0.05 tons/year, aluminum 0.39 tons/year and acidity 20.34 tons/year. The estimated load reductions achieved by the passive treatment systems are shown in the table below. It would appear that reductions are not yet met for iron and acidity. The probable cause is that a couple of the discharges do not have any treatment due to property owner issues. Therefore limestone dust addition is continuing in the headwaters. By comparison with state standards, the stream appears to be chemically restored. Monitoring of the AMD discharge treatment systems and the stream must be continued. A full biological assessment of the stream must be done to confirm restoration. Approximate reductions for each known and treated discharge are listed below.

| Estimated Load Reductions Achieved for Each Priority Discharge | | | | | | | | |
|---|---|---|---|---|---|--|--|--|
| Discharge | <i>Avg Annual Fe Load Reduction (tons/year)</i> | <i>Avg Annual Fe Load-Percent Reduction (%)</i> | <i>Avg Annual Mn Load Reduction (tons/year)</i> | <i>Avg Annual Mn Load-Percent Reduction (%)</i> | <i>Avg Annual Al Load Reduction (tons/year)</i> | <i>*Avg Annual Al Load-Percent Reduction (%)</i> | <i>Avg Annual Acidity Load Reduction (tons/year)</i> | <i>Avg Annual Acidity Load-Percent Reduction (%)</i> |
| LR0-D2 | .23 | 90 | .004 | 20 | .11 | 90 | 2.26 | 95 |
| LR0-D3 | .018 | 90 | .01 | 20 | .12 | 90 | 1.25 | 95 |
| LR0-D4 | .032 | 90 | .002 | 20 | .0017 | 90 | .169 | 95 |
| LR0-D5 | .008 | 90 | .02 | 20 | .125 | 90 | 1.52 | 95 |
| LR0-D6 | .102 | 90 | .002 | 20 | .001 | 90 | .23 | 95 |
| LR0-D7 | .285 | 90 | .02 | 20 | .065 | 90 | 1.93 | 95 |
| LR0-D8 | .0013 | 90 | .0006 | 20 | .006 | 90 | .09 | 95 |
| LR0-D9 | .23 | 90 | .005 | 20 | .02 | 90 | .12 | 95 |
| LR0-D10 | 1.06 | 90 | .001 | 20 | .078 | 90 | 3.91 | 95 |
| LR0-D11 | .027 | 90 | .02 | 20 | .086 | 90 | 1.16 | 95 |
| LR0-D13 | .096 | 90 | .002 | 20 | .011 | 90 | NA | 95 |
| LR0-D14 | 1.98 | 90 | .021 | 20 | .025 | 90 | .18 | 95 |

| | | | | | | | | |
|----------------|---------------|----|--------------|----|--------------|----|---------------|----|
| LR0-D15 | .71 | 90 | .03 | 20 | .012 | 90 | 1.35 | 95 |
| TOTALS | 4.7793 | | .1376 | | .6607 | | 14.169 | |

*Average Annual Al Load Reduction relates to dissolved aluminum only, not total aluminum

Six Mile Run

Shreves Run

Construction of AMD treatment systems has been completed for most of the known discharges in Shreves Run (SX3-D1 to SX3-D3, Growing Greener - \$237,310 and SX3-D4 to SX3-D8, \$129,900 - 319 program). Discharges SX3-D4 through SX3-D8 were not listed on the original priority list. At Station #56, load reductions called for were iron 0.88 tons/year, aluminum 13.3 tons/year, manganese 1.43 tons/year and acidity 144.2 tons/year. As shown in the table below, treatment of the priority discharges is not removing enough aluminum and acidity out of the stream. Therefore all other known discharges needed to be treated to meet the required TMDL reductions.

| Estimated Load Reductions Achieved for Each Priority Discharge | | | | | | | | |
|---|---|---|---|---|---|--|--|--|
| Discharge | <i>Avg Annual Fe Load Reduction (tons/year)</i> | <i>Avg Annual Fe Load-Percent Reduction (%)</i> | <i>Avg Annual Mn Load Reduction (tons/year)</i> | <i>Avg Annual Mn Load-Percent Reduction (%)</i> | <i>Avg Annual Al Load Reduction (tons/year)</i> | <i>*Avg Annual Al Load-Percent Reduction (%)</i> | <i>Avg Annual Acidity Load Reduction (tons/year)</i> | <i>Avg Annual Acidity Load-Percent Reduction (%)</i> |
| SX3-D1 | .756 | 90 | .09 | 20 | 3.18 | 90 | 38.2 | 95 |
| SX3-D2 | .225 | 90 | .026 | 20 | .92 | 90 | 10.2 | 95 |
| SX3-D3 | .045 | 90 | .02 | 20 | .065 | 90 | 6.8 | 95 |
| TOTALS | 1.026 | | .136 | | 4.165 | | 55.2 | |

*Average Annual Al Load Reduction relates to dissolved aluminum only, not total aluminum

Since treatment systems have been constructed on upstream discharges, the stream appears to be chemically restored from the headwaters to just upstream of SX3-D9 near its mouth. March 6, 2007 data shows:

| | |
|------------------|------|
| pH | 5.6 |
| Total Acidity | 20 |
| Total Alkalinity | 20 |
| Al | <0.2 |
| Fe | .09 |
| Mn | .7 |

Funds have been obtained and design is currently underway to construct a combined treatment system for SX3-D9 and SX0-D16 (\$277,495 319 Nonpoint Source Program). These are the last known discharges that require treatment in this sub watershed.

Spruce Hill

In the Spruce Hill area, the headwaters of Six Mile Run, funds have been obtained to construct a treatment system for SX2-D5 and for design/evaluation to deal with SX2-D6, SX2-D7 and SX2-D8. Some limestone dust is currently being added upstream of these sites. When the evaluation is completed, a request for funds will be made if construction of additional treatment systems is recommended. Landowner permission for treatment of the remaining known discharges upstream (SX2-D1 to SX2-D4 and SX2-D9) has not yet been received. After completion of the current projects, the stream conditions will be evaluated and, if needed, an attempt to gain landowner approval for treatment at these sites will be made, based on the updated stream information and the success of other similar projects.

At Station # 58, the mouth of the Spruce Hill area, no reductions are needed for iron or manganese. Around 1.06 tons/year of aluminum and 33.7 tons/year of acidity need to be removed from the stream. As shown in the table below, these loadings may not be met with construction of these systems. Therefore, the stream will be re-evaluated after they are installed. The addition of limestone dust may be enough to meet the reductions needed in the watershed.

| Estimated Load Reductions Expected for Each Priority Discharge | | | | | | | | |
|--|---|---|---|---|---|--|--|--|
| Discharge | <i>Avg Annual Fe Load Reduction (tons/year)</i> | <i>Avg Annual Fe Load-Percent Reduction (%)</i> | <i>Avg Annual Mn Load Reduction (tons/year)</i> | <i>Avg Annual Mn Load-Percent Reduction (%)</i> | <i>Avg Annual Al Load Reduction (tons/year)</i> | <i>*Avg Annual Al Load-Percent Reduction (%)</i> | <i>Avg Annual Acidity Load Reduction (tons/year)</i> | <i>Avg Annual Acidity Load-Percent Reduction (%)</i> |
| SX2-D5 | .126 | 90 | .003 | 20 | .18 | 90 | 1.05 | 95 |
| SX2-D6 | .072 | 90 | .0007 | 20 | .027 | 90 | .342 | 95 |
| SX2-D7 | .009 | 90 | .0003 | 20 | 0 | 90 | .057 | 95 |
| SX2-D8 | .009 | 90 | .006 | 20 | .216 | 90 | 2.57 | 95 |
| Totals | .207 | | .01 | | .423 | | 4.019 | |
| *Average Annual Al Load Reduction relates to dissolved aluminum only, not total aluminum | | | | | | | | |

Brewster Hollow

In Brewster Hollow the treatment system for SX8A-D1 has been completed and funds have been obtained to complete the design and construction of a treatment system for SX8A-D2 (\$214,000 - 319 program). Some other small seeps on this tributary will be remediated by a remaining project, which is currently being permitted. Funds are currently being requested to construct a treatment system for the only remaining known discharge in this subwatershed (SX8-D1).

At Station #54, the mouth of Brewster Hollow, iron needs to be reduced by 14.45 tons/year, aluminum 1.0 tons/year and acidity 27 tons/year. As shown in the table below, construction of these systems will not meet the required load reductions. Therefore a system needs to be constructed on SX8-D1 even though it wasn't on the original list of priorities. Construction of a treatment system on the discharge has the ability to remove 7.23 tons/year of iron, .58 tons/year of aluminum and 23.2 tons/year of acidity.

| Estimated Load Reductions Expected for each Priority Discharge | | | | | | | | |
|--|---|---|---|---|---|--|--|--|
| Discharge | <i>Avg Annual Fe Load Reduction (tons/year)</i> | <i>Avg Annual Fe Load-Percent Reduction (%)</i> | <i>Avg Annual Mn Load Reduction (tons/year)</i> | <i>Avg Annual Mn Load-Percent Reduction (%)</i> | <i>Avg Annual Al Load Reduction (tons/year)</i> | <i>*Avg Annual Al Load-Percent Reduction (%)</i> | <i>Avg Annual Acidity Load Reduction (tons/year)</i> | <i>Avg Annual Acidity Load-Percent Reduction (%)</i> |
| SX8A-D1 | .027 | 90 | .0008 | 20 | 0 | 90 | 0 | 95 |
| SX8A-D2 | .018 | 90 | .008 | 20 | .009 | 90 | 0 | 95 |
| Total | .045 | | .0088 | | .009 | | 0 | |
| *Average Annual Al Load Reduction relates to dissolved aluminum only, not total aluminum | | | | | | | | |

Six Mile Main Stem

In the main stem of Six Mile Run, construction of a treatment system for SX0-D2 (\$151,739 - 319 Nonpoint Source Program) has been completed and funds have been obtained to refurbish the existing treatment system for SX0-D4 and D5 (built before TMDL and this watershed implementation plan was completed). A BAMR reclamation project remediated discharge SX10-D1. At Station #50, the mouth of Six Mile Run, reductions are still needed in aluminum, manganese and acidity, even after subtracting loads from Brewster Hollow, Shreves Run and Spruce Hill. Therefore, other discharges need to be addressed and are shown below in the New Priorities section of this amendment.

| Estimated Load Reductions for Each Achieved Priority Discharge | | | | | | | | |
|--|---|---|---|---|---|--|--|--|
| Discharge | <i>Avg Annual Fe Load Reduction (tons/year)</i> | <i>Avg Annual Fe Load-Percent Reduction (%)</i> | <i>Avg Annual Mn Load Reduction (tons/year)</i> | <i>Avg Annual Mn Load-Percent Reduction (%)</i> | <i>Avg Annual Al Load Reduction (tons/year)</i> | <i>*Avg Annual Al Load-Percent Reduction (%)</i> | <i>Avg Annual Acidity Load Reduction (tons/year)</i> | <i>Avg Annual Acidity Load-Percent Reduction (%)</i> |
| SX0-D2 | .05 | 90 | .0006 | 20 | .25 | 90 | 2.9 | 95 |
| SX10-D1 | .001 | 90 | .002 | 20 | .013 | 90 | .056 | 95 |
| TOTALS | .051 | | .0026 | | .263 | | 2.956 | |
| *Average Annual Al Load Reduction relates to dissolved aluminum only, not total aluminum | | | | | | | | |

New Priorities

Longs Run

All priority projects have been completed in the Longs Run watershed for which Broadtop Township has been able to gain property owner permission. The use of limestone dosing is expected to alleviate the AMD problems caused by other unknown discharges plus the one discharge that had property owner issues. A study is scheduled in spring 2007 to monitor the success of restoration efforts in this watershed.

Six Mile Run

Shreves Run

As stated above, discharges SX3-D4 through SX3-D8 were not listed on the original priority list. At station #56, load reductions being called for were iron 0.88 tons/year, aluminum 13.3 tons/year, manganese 1.43 tons/year and acidity 144.2 tons/year. With the construction of the original priorities in the watershed, only 1.026 tons/year of iron, 0.136 tons of manganese, 4.165 tons/year of aluminum and 55.2 tons/year of acidity are being removed. Therefore, to meet the reductions at Station #56 for aluminum and acidity, the other known discharges in the stream need to be addressed. Their reductions are shown in the table below.

| Estimated Load Reductions Expected for Each Priority Discharge | | | | | | | | |
|--|---|---|---|---|---|--|--|--|
| Discharge | <i>Avg Annual Fe Load Reduction (tons/year)</i> | <i>Avg Annual Fe Load-Reduction Percent (%)</i> | <i>Avg Annual Mn Load Reduction (tons/year)</i> | <i>Avg Annual Mn Load-Reduction Percent (%)</i> | <i>Avg Annual Al Load Reduction (tons/year)</i> | <i>*Avg Annual Al Load-Reduction Percent (%)</i> | <i>Avg Annual Acidity Load Reduction (tons/year)</i> | <i>Avg Annual Acidity Load-Reduction Percent (%)</i> |
| SX3-D4 | .01 | 50 | 0.0 | 13 | .1 | 93 | 1.64 | 93 |
| SX3-D5 | .01 | 50 | .01 | 21 | .13 | 94 | 1.56 | 93 |
| SX3-D6 | N.A. | N.A. | 0.0 | 30 | .01 | 93 | .15 | 93 |
| SX3-D7 | 0.0 | 50 | 0.0 | 15 | .02 | 94 | .23 | 93 |
| SX3-D8 | .02 | 75 | .01 | 18 | .1 | 94 | 1.34 | 93 |
| SX3-D9 | 1.79 | 89 | .02 | 10 | 1.12 | 91 | 9.5 | 85 |
| Totals | 1.83 | | .04 | | 1.48 | | 14.42 | |
| *Average Annual Al Load Reduction relates to dissolved aluminum only, not total aluminum | | | | | | | | |

Brewster Hollow

At Station #54, mouth of Brewster Hollow, iron needs to be reduced by 14.45 tons/year, aluminum 1.0 tons/year and acidity 27 tons/year. Construction projects on the original two priorities SX8A-D1 and SX8A-D2 will in theory remove 0.045 tons/year of iron, 0.0088 tons/year of manganese, 0.009 tons/year of aluminum and no acidity. Therefore a system needs to be constructed on SX8-D1 even though it wasn't on the original list of priorities. Construction of a treatment system on the discharge has the ability to remove 7.23 tons/year of iron, 0.58 tons/year of aluminum and 23.2 tons/year of acidity as shown in the table below.

| Estimated Load Reductions Expected for Priority Discharge | | | | | | | | |
|--|---|---|---|---|---|--|--|--|
| Discharge | <i>Avg Annual Fe Load Reduction (tons/year)</i> | <i>Avg Annual Fe Load-Percent Reduction (%)</i> | <i>Avg Annual Mn Load Reduction (tons/year)</i> | <i>Avg Annual Mn Load-Percent Reduction (%)</i> | <i>Avg Annual Al Load Reduction (tons/year)</i> | <i>*Avg Annual Al Load-Percent Reduction (%)</i> | <i>Avg Annual Acidity Load Reduction (tons/year)</i> | <i>Avg Annual Acidity Load-Percent Reduction (%)</i> |
| SX8-D1 | 7.23 | 90 | .07 | 20 | .58 | 90 | 23.2 | 95 |
| *Average Annual Al Load Reduction relates to dissolved aluminum only, not total aluminum | | | | | | | | |

Main Stem of Six Mile Run

Station #53 is located below Brewster Hollow, Shreves Run and Spruce Hill. Reductions are still needed for iron (21.3 tons/year), even after it is assumed that the loadings in these watersheds have been addressed. Therefore, all the remaining known discharges must be remediated in hopes of meeting this required reduction. These include SXO-D6, SXO-D16, SXO-D7, SXO-D8 and SXO-D9. At the mouth of Six Mile Run, Station #50, the required TMDL still has identified reductions in iron (21.3 tons/year), Manganese (6.6 tons/year) and acidity (403 tons/year). The following known discharges, SXO-D10, SXO-D11, SXO-D13, SXO-D14 and SX10-D2, must be addressed in hopes of meeting the required TMDL reductions. The table below lists the possible reductions with construction of systems on these updated priority discharges.

| Estimated Load Reductions Expected for each Priority Discharge | | | | | | | | |
|---|---|---|---|---|---|--|--|--|
| Discharge | <i>Avg Annual Fe Load Reduction (tons/year)</i> | <i>Avg Annual Fe Load-Percent Reduction (%)</i> | <i>Avg Annual Mn Load Reduction (tons/year)</i> | <i>Avg Annual Mn Load-Percent Reduction (%)</i> | <i>Avg Annual Al Load Reduction (tons/year)</i> | <i>*Avg Annual Al Load-Percent Reduction (%)</i> | <i>Avg Annual Acidity Load Reduction (tons/year)</i> | <i>Avg Annual Acidity Load-Percent Reduction (%)</i> |
| SX0-D6 | 1.62 | 95 | .02 | 26 | .95 | 93 | 10.99 | 94 |
| SX0-D16 | .08 | 50 | .09 | 26 | .93 | 92 | 16.87 | 93 |
| SX0-D7 | .09 | 90 | .04 | 80 | .66 | 90 | 6.29 | 95 |
| SX0-D8 | 1.84 | 90 | .45 | 80 | 1.46 | 90 | 17.18 | 95 |
| SX0-D9 | 2.1 | 90 | .04 | 20 | .69 | 90 | 8.75 | 95 |

| | | | | | | | | |
|--|-------------|----|------------|----|--------------|----|--------------|----|
| Reductions before Station #53 | 5.73 | | .66 | | 4.69 | | 60.08 | |
| SX0-D10 | .014 | 90 | .01 | 20 | .37 | 90 | 3.12 | 95 |
| SX0-D11 | 1.86 | 90 | .04 | 20 | .53 | 90 | 9.74 | 95 |
| SX0-D12 | 1.56 | 90 | .04 | 20 | .44 | 90 | 8.88 | 95 |
| SX0-D13 | .08 | 90 | .004 | 20 | .04 | 90 | .87 | 95 |
| SX0-D14 | .23 | 90 | .09 | 20 | .23 | 90 | 4.17 | 95 |
| SX10-D2 | .71 | 90 | .27 | 20 | 9.12 | 90 | 85.79 | 95 |
| Reductions before Station #50 | 4.45 | | .45 | | 10.73 | | 112.6 | |
| *Average Annual Al Load Reduction relates to dissolved aluminum only, not total aluminum | | | | | | | | |

Funds have also been obtained to construct treatment systems for SX0-D6 and SX0-D7, as well as funds to evaluate how to treat SX0-D8. Once that evaluation is complete, a cost effective treatment system will be constructed for this discharge. In the meantime, the Township plans to continue working from the headwaters downstream constructing treatment systems for SX0-D9 through SX0-D14 and for SX10-D2. After completion of all these projects, the conditions in Six Mile Run will be evaluated to determine if any other work must be done to complete its restoration.

New Priority Discharges for Remediation of Six Mile Run 2007 through 2013

| New Priority Discharges | Estimated Construction Cost | Potential Stream Miles Improved | Other factors/comments | Proposed C |
|-------------------------|-----------------------------|---------------------------------|---|------------|
| SX0-D6 | \$99,970 | .67 miles | Grant is secured. | 2007 |
| SX3-D4,D5, D6, D7&D8 | \$129,900 | 1.0 miles | Grant is secured - Once complete Shreves Run should be restored | 2009 |
| SX3-D9 & SX0-D16 | \$277,495 | .4 miles | Grant is secured - Discharges are located at junction of Shreves Run and Six Mile Run | 2007 |
| SX0-D7 | \$94,240 | 1.0 miles in conjunction with | Grant is secured - Discharge is across | 2007 |

| | | | | |
|-----------------|-----------|---|--|------|
| | | SX0-D8 | from SX0-D8, which will need to be addressed before stream improvement can be achieved. | |
| SX0-D8 | \$25,000 | 1.0 miles in conjunction with SX0-D7 | Needs to be treated or relocated – construction cost will increase after study is complete | 2010 |
| SX0-D9 | \$176,000 | .33 miles | | 2008 |
| SX0-D10 | \$25,000 | .33 miles to mouth in conjunction with SX0-D11, 12, 13, 14 | Aluminum flushing may be a concern | 2011 |
| SX0-D11, 12, 13 | \$91,000 | 33 miles to mouth in conjunction with SX0-D10 and 14 | Space may be a concern | 2011 |
| SX0-D14 | \$50,000 | 33 miles to mouth in conjunction with SX0-D10, 11, 12, and 13 | | 2012 |
| SX10-D2 | \$288,000 | .25 miles | | 2013 |
| SX8-D1 | \$420,000 | .33 miles | Space, aluminum flushing, ferric iron | 2008 |

Six Mile Run Priority Treatment Systems - Update

- Vertical Flow wetland to treat SX0-D6
- Limestone ponds to treat SX3-D4, D5, D6, D7 & D8
- Vertical flow wetland to treat SX3-D9 and a limestone pond for SX0-D16
- Limestone pond to treat SX0-D7
- A study to look at all options to handle SX0-D8. A plan for treatment will be a deliverable for this discharge.
- Vertical flow wetland to treat SX0-D9
- Limestone pond to treat SX0-D10
- Vertical flow wetland to treat SX0-D11, D12, D13
- Vertical flow wetland to treat SX0-D14
- Limestone pond to treat SX10-D2
- Anoxic limestone drain to treat SX8-D1

Sandy Run

Treatment of discharges in the Sandy Run watershed started in 1999, with projects in the headwaters treating discharges SA0-D1, SA0-D2 and SA0-D3. Priorities remain the same with this update. Treatment of all the remaining discharges in Sandy Run watershed was originally estimated to cost \$3.1 million in 2001. Additional costs for operation and maintenance were estimated at \$1.8 million. Treatment options for Sandy Run

| | | (%) | | (%) | | (%) | (tons/year) | Reduction (%) |
|--------------------------------------|---------------|-----|---------------|-----|---------------|-----|---------------|---------------|
| SAO-D4 | 2.80 | 90 | .014 | 20 | 1.12 | 90 | 15.04 | 95 |
| SAO-D5 | 1.29 | 90 | .025 | 20 | 1.25 | 90 | 17.64 | 95 |
| SAO-D6 | 0 | 90 | .0008 | 20 | .009 | 90 | .152 | 95 |
| SAO-D7 | .144 | 90 | .002 | 20 | .054 | 90 | 1.08 | 95 |
| SAO-D8 | .054 | 90 | .002 | 20 | .036 | 90 | .59 | 95 |
| SAO-D9 | .108 | 90 | .003 | 20 | .153 | 90 | 2.54 | 95 |
| SAO-D10 | 1.57 | 90 | .022 | 20 | .981 | 90 | 16.91 | 95 |
| SAO-D11 | 1.66 | 90 | .031 | 20 | .081 | 90 | 5.89 | 95 |
| SAO-D12 | .009 | 90 | .0003 | 20 | 0 | 90 | .038 | 95 |
| SAO-D13 | .612 | 90 | .005 | 20 | 0 | 90 | 1.12 | 95 |
| SAO-D14 | 4.58 | 90 | .176 | 20 | 4.64 | 90 | 69.06 | 95 |
| SAO-D15 | .38 | 90 | .01 | 20 | .045 | 90 | 1.38 | 95 |
| SAO-D16 | .009 | 90 | .0004 | 20 | 0 | 90 | .038 | 95 |
| SAO-D17 | 19.24 | 90 | .22 | 20 | 6.55 | 90 | 94.44 | 95 |
| SA6-D1 | .045 | 90 | .021 | 20 | .306 | 90 | 2.91 | 95 |
| SA6-D2 | 0 | 90 | .004 | 20 | .054 | 90 | .494 | 95 |
| SA6-D3 | .063 | 90 | .007 | 20 | .036 | 90 | .618 | 95 |
| Reductions before Station #64 | 32.564 | | .55 | | 15.315 | | 229.94 | |
| SAO-D18 | .31 | 90 | .004 | 20 | .018 | 90 | 1.04 | 95 |
| SAO-D19 | 0 | 90 | .002 | 20 | .009 | 90 | .26 | 95 |
| SAO-D20 | 0 | 90 | .00008 | 20 | 0 | 90 | .057 | 95 |
| Reductions before Station #67 | .31 | | .00608 | | .027 | | 1.357 | |

*Average Annual Al Load Reduction relates to dissolved aluminum only, not total aluminum

As seen in the table above most discharges on Sandy Run are located above Station #64, before Long Run enters the stream. The TMDL load reductions at this point are 45.1 tons/year for iron, 4.6 tons/year for manganese, 36.4 tons/year for aluminum and 474 tons/year for acidity. As seen in the estimated reductions above all of the known discharges must be treated in order to hope to meet the required load reductions for that point in the watershed. At the mouth of the watershed, Station #67, no further reductions are needed for the required TMDL. Water quality will need to be monitored to decide if priority discharges SAO-D18, SAO-D19 and SAO-D20 will require treatment.