

SUB-WATERSHED ANALYSIS

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NOTE: Sub-basin 75 includes all the direct drainage (valley walls and flood plain) into Main Branch Blacklick Creek.

Sub-basin 76 includes all the direct drainage into South Branch Blacklick Creek.

SUB-WATERSHED ANALYSIS

BLACKLICK CREEK (MOUTH UP TO AND INCLUDING TWO LICK CREEK)

Sub-basin 1 (Unpolluted) - Coal Mining Inventory Maps

1 of 27, 2 of 27, 3 of 27 and 4 of 27.

Sub-basin 1 or the drainage area of Stewart Run covers a total of 4,870 acres. One sampling station, Station #3, was monitored throughout the sampling program within these confines. The pH ranged between 6.9 and 5.2 and an average net alkalinity of 1,529 lb./day was measured. No pollution exists within the sub-basin and it is likely that the alkaline load is even greater closer to the mouth.

Sub-basin 2 (Unpolluted) - Coal Mining Inventory Map 4 of 27.

Sub-basin 2 covers a small drainage area of 214 acres. Sampling station #4 exemplary of the good water quality for this area. The pH fluctuated between 7.1 and 6.0 and an average net alkalinity of 19 lb./day was measured.

Sub-basin 3 (Unpolluted) - Coal Mining Inventory Maps 2 of 27 and 4 of 27.

Greys Run drains an area of 1,134 acres. At sampling station #6 the pH ranged from 7.1 to 5.9 with a resultant net alkalinity of 847 lb./day.

Sub-basin 4 (Unpolluted) - Coal Mining Inventory Map 4 of 27.

Sub-basin 4, a small drainage area of 165 acres, is unpolluted as seen in the results of sampling station #5. An average net alkalinity of 33 lb./day and pH ranging from 7.1 to 6.5 were measured in three months of sampling.

Sub-basin 5 (Unpolluted) - Coal Mining Inventory Map 4 of 27.

The water quality of sub-basin 5 (drainage area 110 acres) is almost neutral in character with an average net alkaline load of 6 lb./day and a pH range of 7.1 to 5.8 having occurred at sampling station #7. Part of strip mine #1 lies within the east end of the sub-basin, but in only one instance was an acidity detected downstream which amounted to an acid load of 1 lb./day.

Sub-basin 6 - Coal Mining Inventory Maps 4 of 27 and 5 of 27.

This small drainage area (355 acres) has been fairly extensively mined. Two strip mines (#1, #2) and seven drift mines exist within the sub-basin confines. Because of a structural dip to the SE only one drift mine discharge is present. Sampling station #4910 monitored the discharge of this drift mine. An average net acid load of 87 lb./day and a pH range of 3.0 to 2.6 were measured. At the mouth of the sub-basin, sampling station #9 water quality data indicated that

this was the only pollution source for the area where a drop in the acid load due to neutralizing effects had occurred. At station #9 the pH ranged between 6.1 and 3.8 and a diminished acid load of 64 lb./day was measured.

Sub-basin 7 (Unpolluted) - Coal Mining Inventory Map 4 of 27.

Sub-basin 7 has a drainage area of 272 acres. A resultant net alkalinity of 22 lb./day and a pH range of 7.1 to 6.0 were measured at sampling station #8 just above the mouth.

Sub-basin 8 (Alkaline at Mouth) - Coal Mining Inventory Maps
1 of 27, 2 of 27, 3 of 27 and 5 of 27.

Muddy Run or sub-basin 8 encompasses a drainage area of 5,677 acres. A marginal amount of pollution exists within the sub-basin but is not apparent at the mouth. Five drift mines monitored by sampling stations #4772, #4773 and #4800 are responsible for acid contributions. Sampling station #4772 monitored the flow of a single drift mine. The pH ranged from 2.9 to 2.7 and an average net acid load of 80 lb./day was measured. Two drift mines were monitored by sampling station #4473. Here an average net acid load of 85 lb./day and a pH range of 3.3 to 3.1 were measured. A remaining two drift mines were sampled at station #4800 with a pH range of 3.2 to 2.7 and an average net acid load of 11 lb./day. The total pollution load (176 lb./day acid) is apparently neutralized within the sub-basin. The water quality upstream of the pollution area showed an average net alkalinity of 1,680 lb./day and a pH range of 7.4 to 5.6 (sampling station #11). Near the mouth of Muddy Run and downstream from the pollution sources there was a resultant net alkalinity of 1,908 lb./day and a pH range of 7.1 to 5.7 at sampling station #10.

Sub-basin 9 - Coal Mining Inventory Map 5 of 27.

Sub-basin 9 covers a small area of 184 acres. Three sampling stations were established and pinpointed two source areas of pollution within the basin. Sampling station #4774 monitored the discharge of a drift mine which lies at the north end of the sub-basin. A pH range of 3.2 to 2.9 and an average net acid load of 11 lb./day were measured here. Sampling station #13A measured the discharge of a pipe flow from the area of two drift mines along the eastern border of the sub-basin. This location was only sampled once because it was discovered late in the Study, at which time the pH was 2.6 and net acid load 32 lb./day. Sampling station #13 closer to the mouth of the Sub-basin ranged in pH from 6.2 to 3.5 and had an average net acid load of 55 lb./day showing the cumulative effects. Though all of the acid load at station #13 was not accounted for by the results of stations #13A and #4774, field investigation of the sub-basin revealed no other sources. The discrepancy is attributed to the lack of enough monitoring of station #13A. Approximately 80 percent of the pollution load at sampling station #13 was assigned to source #13A with 20 percent being produced at #4774.

Sub-basin 10 (Unpolluted) - Coal Mining Inventory Map 5 of 27.

Sub-basin 10 has a small drainage area of 190 acres. Sampling station #14 results revealed an unpolluted condition with a pH range of 7.1 to 6.1 and an average net alkaline load of 128 lb./day.

Sub-basin 11 (Alkaline at Mouth) - Coal Mining Inventory Map 5 of 27.

Sub-basin 11 covers an area of 586 acres. Though consistently alkaline at its mouth, the sub-basin is polluted at the upstream ends with four acid discharges having been monitored. Sampling station #4902 monitored the discharge from the area of a strip mine that had been drift mined and then covered over. The pH ranged between 3.9 and 3.2 and an average net acid load of 50 lb./day was measured. Sampling station #4903, a drift mine discharge, had an average net acid load of 47 lb./day and a pH range of 3.0 to 2.8. Sampling station #4906, a drift mine or simple drainage point for the mines to the immediate west in sub-basin 6, had a pH range of 3.3 to 2.8 and an average net acid load of 144 lb./day. Sampling station #4905 monitored the flow of another drift mine. This mine, which may be linked to the other five drift mines to the immediate north (#4904, #4907, #4908 and adjacent openings) and serve as a structural drainage point, produced a pH range of 2.9 to 2.7 and an average net acid load of 28 lb./day.

The total acid load, from the above sources, 269 lb./day, is apparently neutralized. Sampling station #15 near the mouth of the sub-basin showing a pH range of 7.5 to 5.9 and an average net alkaline load of 104 lb./day.

Sub-basin 12 (Unpolluted) - Coal Mining Inventory Map 5 of 27.

Sub-basin 12, an area covering 450 acres, is unpolluted as is shown by the test results of sampling station #17 near the mouth. An average net alkalinity of 198 lb./day and a pH ranging from 7.5 to 5.8 were measured at this point.

Sub-basin 13 (Alkaline at Mouth) - Coal Mining Inventory Maps 5 of 27 and 6 of 27.

Sub-basin 13 or the main branch of Weirs Run has a drainage area of 773 acres. A good deal of mining has occurred within this area, but has had no detrimental effects on the overall sub-basin water quality. One sampling location, station #4900, measures the combined seepage of three adjacent drift mines along the northern perimeter of the sub-basin. The pH ranged between 4.0 and 2.8 and an average net acid load of 5 lb./day was measured. Two other drift mine discharges were noted within strip mine #5A and a discharge was also noted from the lower southeastern end of the strip mine #4 where earlier documentation says a drift mine is located which may now be covered by an existing sanitary landfill. Though discharges like these exist, water quality near the mouth has remained consistently alkaline as is seen by the results at sampling station #18. The pH ranged between 7.3 and 5.8 and an average net alkalinity of 170 lb./day was measured.

Sub-basin 14 (Unpolluted) - Coal Mining Inventory Map 5 of 27.

This sub-basin lying immediately south of Black Lick has a drainage area of 279 acres. Sampling station #19 at the mouth had a range in pH of 6.9 to 5.6 and an average net alkalinity of 21 lb./day.

Sub-basin 15 (Unpolluted) - Coal Mining Inventory Maps 3 of 27 and 5 of 27.

Sub-basin 15 has a drainage area of 2,235 acres. The good water quality of this area is indicated by the test results of sampling station #16 slightly upstream of its mouth. An average net alkalinity of 924 lb./day and a pH range of 7.0 to 6.1 were measured at this station.

Sub-basin 16 - Coal Mining Inventory Map 6 of 27 and others.

Sub-basin 16 or the watershed area of Two Lick Creek has a drainage area of just over 200 square miles. Though Two Lick Creek was not included as part of the Blacklick Creek Watershed Study, a sampling station was established just west of Coral to monitor the contribution of this major tributary to Blacklick Creek. This station, sampling station #21, had a pH range of 3.7 to 2.7 and an average net acid load of 131, 135 lb./day.

Sub-basin 75 (Mouth up to Two Lick) - Coal Mining Inventory Maps 4 of 27 and 5 of 27.

Sub-basin 75 from the mouth of Blacklick Creek up to sub-basin 16 or Two Lick Creek involves an area of 3,479 acres. This area comprises all of the direct drainage into Blacklick Creek such as that from the valley walls and flood plain. One sampling station, station #2, lies within the confines of sub-basin 75 for these limits monitoring the main branch of Blacklick Creek just above the mouth of sub-basin 1. Measured water quality at this station ranged between a pH of 3.6 to 2.8 with an average acid load of 349,348 lb./day. However, the loading values at this station are in question because the acid load is larger than can be accounted for by the known discharges of the watershed upstream. This may be attributable to insufficient mixing along the stream stretch in the vicinity of station #2 and/or errors in flow calculation because of a correlation with the stream gaging station at Josephine.

The average acid load for this station has been recalculated by adding and subtracting the cumulative contributions from the sub-basins and direct discharges to the main branch between this station and sampling station #66A (on the main stream above sub-basin 42). Sampling station #66A water quality data is considered to be very accurate because: (1) flows were calculated at this station with the use of a surveyed stream cross section and (2) cross check, as described in the beginning of the following discussion for sub-basin

76, have demonstrated the high level of accuracy. The revised average acid load figure for sampling station #2 using this method is 336,676 lb./day.

BLACKLICK CREEK
(TWO LICK TO CONFLUENCE OF NORTH AND SOUTH BRANCHES)

Sub-basin 17 (Unpolluted) - Coal Mining Inventory Map 6 of 27.

Sub-basin 17 covers an area of 287 acres. Though mining had occurred within the sub-basin, no pollution was evident. Sampling station #22C just north of Josephine indicated the good water quality for the sub-basin. The pH fluctuated between 6.9 and 5.5 and an average net alkalinity of 28 lb./day was measured.

Sub-basin 18 (Alkaline at Mouth) - Coal Mining Inventory Map 6 of 27.

Sub-basin 18, immediately south of Palmertown, drains an area of 279 acres. An active strip mine operated by the Morchesky Trucking and Excavation Co. (Mining Permit #643-4) is located in the midwestern section of the sub-basin, but is not detrimental to water quality within the area. Also, two old strip mines (#11, #12) and five abandoned drift mine entries exist at the south end of the area. Two of these drift mines, monitored by sampling station #24A, are responsible for all pollution within the sub-basin. Their discharges had a pH range of 3.1 to 2.8 and an average net acid load of 75 lb./day. Sampling station #24, downstream of the discharge, had an average net acid load of 49 lb./day and a pH range of 4.7 to 3.2. Sampling station #23 (slightly upstream of the mouth) in two cases showed slight acid loads, but had an average net alkaline load of 11 lb./day and a pH range from 6.8 to 4.5 showing fairly consistent neutralization.

Sub-basin 19 - Coal Mining Inventory Map 6 of 27.

Sub-basin 19 covers an area of 478 acres. Much mining has occurred within this area with an active strip mine, located along the eastern section of the sub-basin, being operated by North Cambria Fuel Co. (Mining Permit #10-27). Also, fifteen old drift mines and one other strip mine are located within the sub-basin. All pollution within the drainage area is associated with drift mine discharges which were monitored directly by sampling station #26B, #5017, #5018 and #5019. Two drift mines (#5034) in the vicinity of strip mine #15 were monitored by stream sampling station #27. The total pollution load for the sub-basin is indicated by the sum of pollution at stream sampling station #26 and drift mine #5017, the discharge of which enters slightly further downstream.

Station #26 had a pH range of 3.7 to 2.9 and an average net acid load of 492 lb./day. Sampling station #5017 has a pH range of 2.9 to 2.3 and an average net acid load of 123 lb./day. Approximately 54 percent of the pollution within the sub-basin was contributed by the drift mine monitored by sampling station #5018; 20 percent by #5017; 13 percent by drift mines directly east of strip mine #13; and six percent each by #26B and #5019.

Sub-basin 20 - Coal Mining Inventory Map 6 of 27.

Sub-basin 20 has a drainage area of 105 acres. This area is only slightly polluted and is monitored by one sampling station, station #25, just upstream of its mouth. The pH ranged from 3.5 to 2.9 and an average net acidity of 41 lb./day was measured which is attributable to discharges from the vicinity of two drift mines located slightly upstream.

Sub-basin 21 - Coal Mining Inventory Maps 6 to 27 and 9 to 27.

Sub-basin 21 which lies east of Coral consists of an area of 2,623 acres. Sampling station #31 had been established at its mouth to measure overall pollution effects. At this location of pH from 3.7 to 3.1 and average net acid load of 2,615 lb./day were measured. Further upstream at sampling station #32 a pH of between 3.4 and 2.9 and an average net acid load of 2,483 lb./day occurred. The excess acid between these stations is attributable to seepage from strip mine #18 and primarily strip mine #20 which is actively being used as a sanitary landfill. Sampling station #33 had been established upstream of station #32 locating the largest acid source within the sub-basin. A pH range of between 6.1 and 3.0 occurred at station #33 with a reduction in average acid load of 2,039 lb./day compared to station #32. This contribution is attributable to deep mine discharges from the vicinity of sampling station #32C which only caught part of this discharge. Above sampling station #33 all pollution was accounted for by a drift mine discharge monitored by sampling station #4922. At this station an average acid load of 676 lb./day and pH range of between 3.1 and 2.5 were noted.

Sub-basin 22 - Coal Mining Inventory Map 6 of 27.

Sub-basin 22 has a drainage of 1.097 acres. Strip mine spoil seepages account for the pollution at stream sampling locations #29 and #30 at the approximate middle of the sub-basin. A pH range of 4.7 to 3.9 and an average net acidity of 84 lb./day were measured at sampling station #29. At sampling station #30 a pH range of 4.6 to 3.9 and an average net acid load of 126 lb./day occurred.

Sub-basin 24 - Coal Mining Inventory Map 12 of 27.

Sub-basin 24 to the southwest of Heshbon has a drainage area of 1,206 acres. As in sub-basin 22, strip mine spoil is the source of acid producing material for this drainage basin. A negligible average net acid load of 28 lb./day and a pH range of 5.8 to 4.6 were measured at sampling station #38 slightly upstream from the mouth of the subbasin. The major source of this acid originates within strip mine #36 through which one of the major tributaries of the sub-basin travels. Sampling station #36, which monitors this tributary, had a pH range of 4.6 to 3.9 and an average net acid load of 54 lb./day - part of which is apparently neutralized as it approaches sampling station #38.

Sub-basin 25 - Coal Mining Inventory Map 9 of 27.

Sub-basin 25 consists of a drainage area of 352 acres. Deep mine discharges of the Virginian #14 mine (L.C.S. Collieries Co.) are considered mainly responsible for stream degradation within the subbasin. Sampling station #4898, which monitored a discharge believed to be an old drift mine of this complex, accounted for 50 percent of the pollution produced within the sub-basin. Its discharge had an average net acid load of 1,768 lb./day and pH ranging between 2.5 and 2.1. Sampling station #4893, slightly further upstream, was the location of seepage from strip mine #45 which has been used as a site for coal waste disposal. Here a pH of between 2.6 and 2.0 and average net acid load of 381 lb./day were measured. Sampling station #40, upstream of strip mines #45 and #46, monitored a negligible acid load which may be attributed to strip mine #27 being extended by North Cambria Fuel Co. as the D.B. No. 1 strip. This discharge amounted to an average net acid load of 40 lb./day with a pH ranging from 4.9 to 4.1. The mouth of the sub-basin was monitored via sampling station #41 where an average net acidity of 3,554 lb./day and pH range from 2.9 to 2.4 were measured. Subtracting the acid load values of the other measured discharges within the sub-basin leaves an unaccounted for excess of 1,365 lb./day. This excess was an undetected discharge which may be related to surface mines #45 and #46 or the Virginian #14 mine complex.

Sub-basin 26 - Coal Mining Inventory Map 9 of 27.

Sub-basin 26, the main branch of Aulds Run, has a drainage area of 807 acres. One source of pollution exists within this area which radically degrades the water quality. This source, a drift mine discharge of the Virginian #14 mine of the L.C.S. Collieries company, was monitored by sampling station #4890. Its discharge has a pH range of 2.9 to 2.5 and an average net acid load of 5,033 lb./day. At the mouth of the sub-basin below the pollution source (sampling station #42), part of this acidity had been neutralized. Here, a pH range of between 3.0 and 2.4 and an average net acid load of 4,136 lb./day were measured. Though another drift mine discharge monitored by sampling station #4895 (Sunny Creek Mine) lies upstream, its discharge was consistently alkaline.

Sub-basin 27 - Coal Mining Inventory Map 12 of 27.

Sub-basin 27, the drainage area of Ramsey Run, consists of an area of 1,902 acres. Two mine waste banks located near the center of the subbasin constitute the source regions of pollution. Mine waste bank D8 was monitored by sampling stations #46 and #46A. Station #46 had a pH of 6.4 to 3.5 and an average net acid load of 125 lb./day catching only a small part of its seepage. Sampling station #46A though, had a pH range of 2.8 to 2.2 and an average net acid load of 1,627 lb./day. Mine waste bank D9 was monitored by sampling station #45. Here a pH range of 4.2 to 3.2 and an average net acid load of 1,114 lb./day were measured. Downstream at sampling station #44 a pH of between 3.8 and

3.0 and an average net acid discharge of 2,162 lb./day (a reduction compared to 2,866 lb./day total upstream) were measured showing a partial neutralizing effect. This neutralization effect may have also come into play further upstream. It is likely that the actual acid load contributions of both mine waste banks compared to those available as measured in the field are in fact greater. Part of the contribution of acidity would have been offset initially by alkaline discharges or stream conditions upstream. A net alkaline load of 150 lb./day total from drift mines #46C, #46D and #4876 was measured. This alkaline load would have neutralized an equal acidic load upstream of sampling station #46. Thus the actual acid load contribution of mine waste dump D8 at station #46 was 275 lb./day minimum of not more because of a possible stream alkalinity upstream. This relationship applies as well to mine waste dump D9 above which lies a considerable length of unpolluted stream.

Sub-basin 28 (Unpolluted) Coal Mining Inventory Map 12 of 27.

Sub-basin 28, consisting of an area of 234 acres, lies immediately north of Heshbon. Though a large section of the sub-basin has been strip mined (strip mine #50), this has had no detrimental effects on water quality. A pH range of 7.2 to 5.4 and an average net alkalinity of 83 lb./day were measured near and mouth of the drainage basin at sampling station #43.

Sub-basin 29 - Coal Mining Inventory Maps 12 of 27 and 13 of 27.

Sub-basin 29 has a drainage area of 402 acres. Sampling station #47 at the mouth showed a slight degree of natural acidity within the sub-basin evidenced by a pH range of 6.0 to 3.8 and an average net acid load of 10 lb./day.

Sub-basin 30 (Alkaline at Mouth) - Coal Mining Inventory Maps 7 of 27 through 11 of 27.

Sub-basin 30 which encircles Brush Valley, consists of everything draining into Brush Creek or an area of 14,233 acres. Two regular sampling stations monitored the discharge of a drift mine (sampling station #4835) and the main stream (sampling station #51) just above the mouth. A moderate average net acid load of 113 lb./day was measured at sampling station #4835 with a pH range of 3.2 to 2.6. This acid load was easily neutralized within the sub-basin as is seen by the test results of sampling station #51. Here a pH range of between 6.8 to 5.4 and an average net alkaline load of 1,407 lb./day were measured.

Sub-basin 31 - Coal Mining Inventory Map 10 of 27.

Sub-basin 31 constitutes a drainage area of 1,055 acres. Two drift mine discharges are responsible for stream degradation in this vicinity monitored by sampling stations #4868 and #4869. Their collective effect on water quality for the basin was indicated at sampling station #52 downstream. Here a pH of between 3.7 to 2.4 and an average net acid load of 3,888 lb./day were measured. 70 percent

of this acid load was measured at source #4868 with the remaining pollution being attributable to #4869.

Sub-basin 32 - Coal Mining Inventory Maps 10 of 27 and 13 of 27.

Sub-basin 32 encompasses a drainage area of 1,184 acres northeast of Dias. Sampling station #53, which was situated at the mouth of the sub-basin, had a pH which fluctuated from 3.3 to 2.6 and an average net acid load of 3,040 lb./day. Seepage from the general area of strip mine #57 accounted for less than three percent of this load monitored by sampling stations #4863 and #4863A with a total average net acid load of 90 lb./day. Closer to the mouth of the sub-basin, sampling station #53A was established to measure a seepage which may be an intersection of the old Caldwell Smokeless Coal Co.-Caldwell No. 1 mine amounting to an average net acid load of 65 lb./day. The excess acid, 2,885 lb./day, measured at sampling station #53 is produced by mine waste material which has been deposited in a large part of strip mine #55 (NACCO Refuse Disposal Permit No. 3-68-1149 strip pit).

Sub-basin 33 - Coal Mining Inventory Maps 12 of 27 and 13 of 27.

Sub-basin 33 situated south and southwest of Dias has a drainage area of 973 acres. The mouth of this drainage basin was monitored via sampling station #54. At this station a pH of between 5.5 to 3.8 and average net acid load of 56 lb./day were measured. Sampling stations #4875 and #4877 monitored small deep mine discharges amounting to a total of only 12 lb./day acid on an average. The unaccounted for excess indicated at sampling station #54 was not visually detectable in the field, but is considered produced by seepage from strip mine spoil and some coal waste in the area of the mouth of the sub-basin.

Sub-basin 34 - Coal Mining Inventory Maps 12 of 27 and 13 of 27.

Sub-basin 34, which lies immediately north of Armagh, is composed of a drainage area of 1,748 acres. Sampling station #56 was established at its mouth and had a pH range of between 5.0 and 2.5 with an average net acid load of 8,136 lb./day. This large pollution contribution is introduced downstream of sampling station #56A where an average net alkalinity of 1,056 lb./day and a pH ranging from 9.0 to 4.5 were measured. Acid discharges of 290 and 62 lb./day were measured at sampling stations #4859 and #56B respectively. These discharges are somewhat obscure as to origin. Discharge location #4859 may either be drift mine openings or more likely a subsidence area into a large deep mine complex. Station #56B may also be a deep mine discharge, but could simply be seepage associated with the spoil of strip mine #67. These discharges though, leave an excess contribution that is the sum of alkalinity measured at #56A plus the as yet unaccounted for excess indicated at the mouth of the sub-basin totalling to 8,840 lb./day. This acid load is believed attributable to discharges from mine waste bank D24 fed partially by flow from deep mine workings intersected near the southeastern tip of strip mine #64.

Sub-basin 35 - Coal Mining Inventory Map 13 of 27.

Sub-basin 35 directly north of Dilltown covers an area of 736 acres. Three sampling stations were established within its confines. Two distinct drift mine discharges exist within the sub-basin monitored by sampling stations #4748 and #4874. These two discharges accounted for 63 percent and 27 percent respectively of the total acid load at sampling station #57 near the mouth of the sub-basin. Here a pH of between 3.6 to 2.7 and an average net acid load of 436 lb./day were measured. The remaining ten percent is attributable to seepage from the area of mine waste dump D28.

Sub-basin 36 (Unpolluted) - Coal Mining Inventory Maps 11 of 27, 13 of 27 and 14 of 27.

The drainage basin of Mardis Run or 3,063 acres comprises the limits of sub-basin 36. All water quality data collected for this area was consistently alkaline. Sampling station #62 near the mouth of the sub-basin was indicative of this characteristic. At this station a pH range of from 6.8 to 5.1 and an average net alkalinity of 521 lb./day were measured.

Sub-basin 37 (Unpolluted) - Coal Mining Inventory Map 13 of 27.

The limited 148 acres of sub-basin 37 are unpolluted. Sampling station #58 near the mouth of the area had a pH range of between 7.2 and 5.3 and an average net alkalinity of 309 lb./day.

Sub-basin 38 (Unpolluted) - Coal Mining Inventory Maps 13 of 27, and 14 of 27.

The unnamed perennial stream which comprises sub-basin 38 has a drainage area of 340 acres. This area was spot checked twice - once during the grab sampling and additionally during the regular sampling program. Sampling station #63, at the mouth of the sub-basin, had a pH of 6.0 and an average net alkaline load of 7 lb./day during a regular sampling run.

Sub-basin 39 (Unpolluted) - Coal Mining Inventory Maps 11 of 27 and 14 of 27.

The drainage area of Clarke Run, 1,601 acres, establishes the limits of sub-basin 39. Sampling station #64 just above the mouth indicated the good water quality of the area. At this location a pH ranging between 6.7 and 5.0 and an average net alkaline load of 43 lb./day were measured.

Sub-basin 40 (Unpolluted) - Coal Mining Inventory Maps 11 of 27 and 14 of 27.

Sub-basin 40 lying west of Wehrum has a drainage area of 919 acres. Water quality for this area was monitored by sampling station #67 at which a pH of between 6.5 and 5.0 and an average net alkaline load of 8 lb./day were measured.

Sub-basin 41 (Unpolluted) - Coal Mining Inventory Map 14 of 27.

Sub-basin 41 consists of an area of 360 acres. Because of poor accessibility, sampling station #65 was only checked during the grab sampling program. At this time no pollution problems were encountered and the water quality for the sub-basin was obviously alkaline in character.

Sub-basin 42 (Unpolluted) - Coal Mining Inventory Map 14 of 27.

An area of 813 acres is covered by sub-basin 42. Sampling station #66, at the mouth of the sub-basin, is indicative of its water quality with a pH range of 6.4 to 5.2 and an average net alkaline load of 93 lb./day.

Sub-basin 43 - Coal Mining Inventory Map 14 of 27.

Sub-basin 43 encompasses the drainage area of Ramsey Run of 339 acres. A significant source of pollution, an artesian mine shaft discharge (4746), lies just upstream of its mouth. Sampling station #68 which caught this pollution had an average net acid load of 8,704 lb./day and a pH range of 3.4 to 2.2. Above this discharge Ramsey Run is obviously alkaline as is indicated by the test results of sample location #68A.

Sub-basin 44 - Coal Mining Inventory Maps 14 of 27 and 25 of 27.

Sub-basin 44 coincides with the drainage basin of Rummel Run for an area of 2,887 acres. Many sources of pollution exist within the area which were monitored by a network of sampling stations established along tributaries to the main stream. Sampling station #72, set up on the northern most tributary to Rummel Run, measured a pollution load attributable to strip mine seepage and discharges from drift mines along the highwall of strip mine 81. The pH at this station ranged between 4.2 and 3.3 and an average net acid discharge of 241 lb./day occurred. Sampling stations #72A, #73, #74 and #74A were exemplary of a combined pollution contribution of drift mines (#4853, #4854, #4855) and strip mine spoil seepage from the area of strip mine #79. A pH range of between 4.4 to 2.5 and a total average net acid load of 460 lb./day was noted from this area combining the results of these four sampling stations. Sampling stations #75 and #75A measured seepages from drift mines in their immediate vicinity. A pH range of from 4.4 to 2.8 and an average net acid load of 33 lb./day were measured at sampling station #75 below these discharges. Two sampling stations, #71 and #71A, set up along the main branch of Rummel Run indicated the cumulative pollution effect within the subbasin. Comparing the average net acid loads of all sampling stations upstream and those of station #71 and #71A on 8/02/74 and 8/22/74 (flows at station #71 on first three dates questionable) shows that all pollution within the area had been measured by the upper sampling stations. Also, a slight neutralization progressively downstream was indicated. The average net acid load at station #71A was 78 lb./day.

Sub-basin 45 - Coal Mining Inventory Map 11 of 27.

Sub-basin 45 is composed of a drainage area of 1,041 acres. Two sampling stations indicated dramatically the source of pollution input for this area. The entire upper end of the sub-basin is unpolluted as is supported by the test results of sampling station #69C. At the mouth of the sub-basin though, a pH range of between 3.3 and 2.5 and an average net acid load of 2,363 lb./day were measured at sampling station #69. The pollution of sub-basin 45 occurs immediately above its mouth with seepage from mine waste banks D5 and D6 which extend directly into the stream channel and must drain into the sub-basin because of local drainage characteristics.

Sub-basin 46 - Coal Mining Inventory Map 11 of 27.

The pollution load of this area (207 acres) is attributable to seepage from mine waste bank D5 at the base of the sub-basin. Sampling station #69A, at the mouth of the sub-basin, monitored the discharge. A slight degradation was noted between the water quality of sampling station #69D, which lay slightly upstream and was obviously unpolluted, and sampling station #69A. Test results showed a pH ranging between 3.4 and 2.6 and an average net acid discharge of 111 lb./day at station #69A.

Sub-basin 47 (Upolluted) - Coal Mining Inventory Maps 14 of 27 and 25 of 27.

Sub-basin 47 which has a drainage area of 402 acres was found to be unpolluted during the preliminary grab sample program. Because of the difficulty in accessibility, this area was not sampled during the regular sampling period.

Sub-basin 75 (Two Lick to Confluence of North and South Branches Blacklick) - Coal Mining Inventory Maps 6 of 27 and 11 of 27 through 14 of 27.

Sub-basin 75 above the mouth of sub-basin 16, Two Lick Creek, covers an area of approximately 7,398 acres. Three sampling stations were established directly on Blacklick Creek within these limits. Sampling station #22A (map 6 of 27) corresponds with the U.S.G.S. stream gaging station at Josephine. Sampling station #52A (map 13 of 27) was situated east of Dias on Blacklick Creek just upstream of the mouth of sub-basin 31. Sampling station #66A was established 28.9 miles above the mouth of Blacklick Creek just southwest of Wehrum (map 14 of 27).

The water quality data at stations #22A and #52A are considered to be questionable and therefore, their average acid loads have been recalculated to better approximate the real stream conditions (see explanation of recalculation for station #2 quality in description of sub-basin 75 below Two Lick Creek). The water quality and flow data for sampling station #66A is considered to be accurate and was the primary source of information used in recalculating these two acid loads.

The average acid load at station #22A has been recalculated as 209,830 lb./day and the value for sampling station #52A is 184,560 lb./day. A pH ranging from 4.1 to 2.5 and an average net acid load of 165,143 lb./day were measured at sampling station #66A.

Numerous other sampling stations were established along sub-basin 75 measuring acid discharges from drift mines, mine waste dumps and seepages associated with the intersections of deep mine workings. These are listed according to type of discharge and significance:

DRIFT MINE DISCHARGES

<u>Station</u>	<u>pH max.</u>	<u>pH min.</u>	<u>Average net acid load</u>
4858	2.7	2.3	7064 lb./day (map 13 of 27)
22	3.0	2.5	2279 lb./day (map 6 of 27)
5026	2.9	2.2	1306 lb./day (map 6 of 27)
4857	2.8	2.4	445 lb./day (map 13 of 27)
4889	3.0	2.6	239 lb./day (map 12 of 27)
4870	2.9	2.6	152 lb./day (map 13 of 27)
4866A	2.8	2.5	60 lb./day (map 13 of 27)
5028	2.8	2.2	26 lb./day (map 6 of 27)
5023	3.3	2.7	2 lb./day (map 6 of 27)

MINE WASTE DUMP DISCHARGES

Strip mine pit 115 filled with mine waste (map 13 of 27)

<u>Station</u>	<u>pH max.</u>	<u>PH min.</u>	<u>Average net acid load</u>
4878A	2.8	2.4	873 lb./day
4878B	2.7	2.3	260 lb./day
4879A	2.9	2.3	696 lb./day
4879B	2.7	2.3	279 lb./day
52B	2.8	2.4	<u>2356</u> lb./day
			4464 lb./day total

D7 Mine Dump (map 14 of 27)

<u>Station</u>	<u>pH max.</u>	<u>PH min.</u>	<u>Average net acid load</u>
4743	3.3	2.1	753 lb./day
69B	1.9	1.0	<u>1184</u> lb./day
			1937 lb./day

D10 Mine Dump (map 14 of 27)

<u>Station</u>	<u>pH max.</u>	<u>PH min.</u>	<u>Average net acid load</u>
4897	2.7	2.1	1558 lb./day total

D12 Mine Dump (map 6 of 27)

<u>Station</u>		<u>Average net acid load</u>
22B		2494 lb./day*
(22 drift mine)	subtract	<u>2090</u> lb./day*
		404 lb./day total

*Note - these two figures computed using values for those dates on which both stations were collected.

DEEP MINE INTERSECTIONS OR SEEPAGES

Thermal No. 15 mine (map 13 of 27)

<u>Station</u>	<u>pH max.</u>	<u>PH min.</u>	<u>Average net acid load</u>
4874A	2.7	2.3	486 lb./day
4873	3.2	2.8	31 lb./day
4871	2.8	2.7	<u>6 lb./day</u>
			523 lb./day total

Caldwell No. 1 mine (map 13 of 27)

<u>Station</u>	<u>pH max.</u>	<u>PH min.</u>	<u>Average net acid load</u>
4866	2.8	2.5	486 lb./day

POINT DISCHARGE

<u>Station</u>	<u>pH max.</u>	<u>PH min.</u>	<u>Average net acid load</u>
4744	4.3	3.3	8 lb./day (map 14 of 27)

NORTH BRANCH BLACKLICK CREEK

Sub-basin 48 - Coal Mining Inventory Maps 11 of 27 and 15 of 27 through 22 of 27.

Sub-basin 48 encompasses most of the main branch of North Branch Blacklick Creek covering in area of 26,631 acres. Within this sub-basin, four regular sampling stations were established directly on the main stream to give a progressive cumulative picture of pollution along its length. Sampling station #76 (map 22 of 27) which lies at the mouth of North Branch Blacklick Creek, not only is indicative of the water quality of sub-basin 48, but shows the cumulative effects of inputs from sub-basins 48A, 48B and 48C which will be discussed in their respective places. At station #76 a pH range between 6.7 and 2.4 and an average net acid load of 54,924 lb./day were measured. Sampling stations #85A, #97 and #102 lie respectively further upstream sampling the main branch of North Branch Blacklick Creek. At sampling station #85A, located near White Mill Crossing (map 22 of 27) just upstream of the mouth of Elk Creek, a pH range of between 8.4 and 6.3 and an average net alkalinity of 36,462 lb./day occurred. Above this point, all water quality was alkaline in nature inclusive of sampling station #97, #102 and all tributary streams within subbasin 48 upstream of station #85A.

Degradation of North Branch Blacklick Creek then, occurs between its mouth (sampling station #76) and sampling station #85A. Between these stations 91,548 lb./day of acid were introduced via four sources. Slightly over 83 percent of this total load is attributable to sub-basins 48A and 48B measured at sampling station #81 (map 22 of 27). Just under 17 percent of the remaining contribution is from an abandoned slope mine discharge of the Commerical Coal Mining Company monitored by sampling station #80A. At this location an average net acid load of 15,194 lb./day and a pH ranging from 3.0 to 2.4 were measured. A remaining insignificant 0.1 percent or total average net acid load of 100 lb./day was noted combining the results of sampling stations #78 and #79 and was considered as being natural in origin.

Sub-basin 48A and 48B - Coal Mining Inventory Maps 17 of 27 and 19 of 27 through 23 of 27.

Sub-basin 48A encompasses everything which drains into Elk Creek with the exception of the area above Preisser Crossing considered separately as sub-basin 48B. Sub-basin 48A covers an area of 12,190 acres while sub-basin 48B encircles 2,332 acres. The mouth of subbasin 48B was monitored via sampling station #101 (map 20 of 27) where an average net acid load of 53,958 lb./day and pH ranging from 3.0 to 2.3 were measured. The acid load measured at station #101 has been attributed to acidic seepage from large mine wastebanks lying

upstream of Preisser Crossing. An extensive investigation of this subbasin was not made when it was determined that considerable active operations were underway in the area. Eastern Associated Coal Company is actively operating deep mines within the Lower Kittanning coal seam in areas underlying subbasin 48B. Discharge from the deep mine operations occur at a treatment plant in subbasin 48A just north of Regan Junction.

Two mine waste banks exist within sub-basin 48B which are active. The largest and further to the north (D13) appears to be actively operated by the Eastern Associated Coal Company. Mine Dump D14, just to the south of D13, had been approved for reprocessing by Bentley Coal Co., Inc. (Drainage Permit #4274SM4). Strip mine #90, within which four drift mine discharges were noted, is located near the subbasin headwaters. Though these discharges were not directly monitored, little or no acid contribution is suspected because the drift openings were driven into the Lower Freeport coal which is usually not a significant pollutant in the Blacklick Creek area. In view of the active status of the refuse banks this area would not be eligible for abatement actions and no detailed investigation was pursued.

Sampling station #81 monitored the mouth of sub-basin 48A indicating the end result of inputs, from both sub-basins 48A and 48B. A pH ranging from 8.2 to 2.7 and an average net acid load of 76,254 lb./day were measured at this point. All other sampling stations, with the exception of station #88, along tributary streams to Elk Creek within sub-basin 48A were found to be consistently alkaline in quality. Sampling station #88 had a pH ranging from 6.1 to 4.3 and an insignificant average net acid load of 24 lb./day.

Subtracting the acid loads measured at sampling station #101 of subbasin 48B and that of sampling station #88 of sub-basin 48A from the data of sampling station #81 left an excess acid load of 22,272 lb./day. Because an acid load from further upstream would have been offset by an equal alkaline load, the measured average alkaline contributions of the regular sampling stations within sub-basin 48A were added to this excess figure to calculate the actual acid contribution of the other pollution source before partial neutralization. The revised figure was an average net acid load of 23,473 lb./day with a radical range between 238,011 lb./day acidity and 208,917 lb./day alkalinity. The real average figure could be different because of the sampling conducted on this area. Some alkaline streams were not monitored extensively after the initial grab sample, and because of the presence of active mine drainage treatment facilities, a network of stations was not established since the purpose of the investigation was to study the abandoned problems.

Barnes and Tucker Coal Co. operates a treatment plant along Crooked Run just southwest of Duman Lake. A second plant, mentioned previously with reference to sub-basin 48B, is operated by Eastern Associated Coal Co. handling discharges associated with their Colver mine. This plant is located directly north of Regan Junction and west

of sampling station #89 along the main branch of Elk Creek. Of the total amount of acid produced within sub-basins 48A and 48B, 69.7 percent is accounted for at sampling station #101 with the remaining being unaccounted for by abandoned sources.

Sub-basin 48C (Unpolluted) - Coal Mining Inventory Maps 18 of 27 and 21 of 27.

Sub-basin 48C covers an area of 2,632 acres and is composed of all the drainage into North Branch Blacklick Creek immediately above Colver Reservoir. Though extensively strip mined in previous years no deleterious effects remain as was indicated by the good quality of water present in the reservoir below at sampling station #102 of sub-basin 48.

SOUTH BRANCH BLACKLICK CREEK

Sub-basin 49 - Coal Mining Inventory Map 25 of 27.

Sub-basin 49 is the drainage area of Shuman Run covering 920 acres. Sampling station #106 monitored the quality of water for the entire basin at its mouth. Very little pollution was present within the area. An average net acid load of 44 lb./day and pH range of between 6.1 and 4.3 were measured at station #106. This acid load is considered natural in origin.

Sub-basin 50 - Coal Mining Inventory Map 25 of 27.

Bracken Run drains sub-basin 50 with a watershed area of 779 acres. Sampling station #107 was located near its mouth. Measurements resulted in an average net acid load of 292 lb./day and a pH range of between 4.4 and 3.8. Though an active strip mine operated by Ace Drilling Coal Co. (drainage permit #4272SM10) is located in the south end of the sub-basin, strip mine #97 was considered responsible for the acid load contribution of the area rather than the active workings.

Sub-basin 51 - Coal Mining Inventory Map 22 of 27.

Sub-basin 51 is a small area of only 383 acres. Sampling station #108 was positioned at the mouth of the sub-basin. An insignificant average net acid load of 3 lb./day and pH ranging from 5.1 to 3.6 were measured here. These conditions were from 5.1 to 3.6 were measured here. These conditions were considered as being natural water quality characteristics because of the lack of any source areas within the sub-basin.

Sub-basin 52 - Coal Mining Inventory Maps 22 of 27 and 25 of 27.

Sub-basin 52 is a drainage basin covering 1,103 acres. Two sampling stations had been established within the area. Sampling station #109 monitored the collective water quality just above the mouth of the sub-basin where a pH ranging from 4.5 to 3.3 and an average net acid discharge of 587 lb./day were measured. The second sampling station, #4797, collected discharges from two drift mines on the tip of strip mine #96. At this point the pH fluctuated between 2.9 and 2.5 and an average net acid load of 98 lb./day was noted. Discharges from the recently reclaimed northern tip of strip mine #119 and unreclaimed strip mine #98 were collectively considered responsible for the excess 489 lb./day acid load at sampling station #109.

Sub-basin 53 - Coal Mining Inventory Map 22 of 27.

This sub-basin has a small drainage area of 239 acres. Sampling station #110 had been established at its mouth where an average net acid load of 22 lb./day and pH range of between 4.5 and 3.6 were measured. Strip mines #101, #102 and #103 located within the basin were observed as being very heavily overgrown and partially reclaimed. The small acid load may be attributed to surface runoff or seepage unnoticed within the area of these strip mines.

Sub-basin 54 - Coal Mining Inventory Maps 22 of 27 and 23 of 27.

Sub-basin 54 encompasses the drainage of Coalpit Run with an area of 1,899 acres. Three sampling stations established on the main branch of the stream measured the cumulative effects on water quality for the sub-basin. Sampling station #112, just above the mouth of the sub-basin, had an average net acid load of 897 lb./day and a pH ranging from 3.6 to 2.9. Sampling station #112A, just east of mine waste dump D44, had a Ph range of between 3.5 and 2.8 and an average net acid load of 712 lb./day. Approximately 3,500 feet further upstream lay sampling station #114 with a pH of between 3.3 and 2.7 and a slightly smaller average net acid load of 704 lb./day. The increase in acid load (193 lb./day) between these three sampling stations is attributable to discharges of the Commercial Coal Mining Co. - Commercial No. 2 and Commercial No. 5 mines within the Lower Kittanning coal which lie respectively south and north of Coalpit Run. Their actual acid contribution though, is slightly higher than the fore-named 193 lb./day figure. An additional 66 lb./day must be added because this amount was neutralized by an equal average net alkaline contribution measured at sampling station #113 on an intermediary tributary. The revised figure is an average net acid discharge of 259 lb./day of 26.9 percent of the total acid produced within the sub-basin.

Just north of Cardiff lies an abandoned mining complex of the Imperial Cardiff Coal Co. responsible for the remaining pollution produced within sub-basin 54 measured cumulatively at station #114. An average net acid load of 200 lb./day was contributed by a drift mine monitored by sampling station #5079. An additional 20 lb./day discharge originated with two adjacent drift mines (sampling stations #114A and #114B). These discharges accounted for another 22.9 percent of the total acid produced within the sub-basin. Mine waste dump D45 contributed an average net acid load of 484 lb./day measured collectively by sampling stations #114 and #114C. This contribution was 50.3 percent of the total acid production within sub-basin 54.

Sub-basin 55 - Coal Mining Inventory Maps 22 of 27 and 25 of 27.

Sub-basin 55 covers a small area of 348 acres. Two sampling stations were established within the area. Sampling station #115A measured the discharge of a drift mine along the midwestern border of the drainage basin. Though the drift itself was covered, a pipe had been installed near the road to drain the mine. A pH of from 2.9 to 2.3 and average net acid contribution of 393 lb./day were noted here. Sampling station #115 monitored an additional but smaller discharge assumed related to the same mine complex. At this station a pH of between 4.9 and 3.8 and average net acid load of 60 lb./day were measured. Because the discharges measured were independent of each other, their acid loads must be added for a cumulative pollution picture of the sub-basin.

Sub-basin 56 - Coal Mining Inventory Maps 22 of 27 and 23 of 27.

Sub-basin 56 encompasses an area of 358 acres draining the valley southwest of Cardiff. Sampling station #116 was established near the mouth of the basin. At this point an average net acid discharge of 110 lb./day and pH fluctuating between 4.4 and 3.2 were measured. This acidity is produced by a deep mine discharge from a subsided area near the northeast tip of strip mine #107.

Sub-basin 57 - Coal Mining Inventory Maps 23 of 27 and 25 of 27.

Sub-basin 57 is composed of the watershed of a small perennial stream west of Nanty Glo with a drainage area of 174 acres. Two sampling stations within this sub-basin pinpointed the source of pollution. Sampling station #117 had been established at the mouth of the stream. After twelve months of sampling, a resultant pH range of between 4.3 and 2.9 and average net acidity of 173 lb./day were noted. Sampling station #117A, upstream of station #117, had a pH ranging from 3.0 to 2.8 and an average net acid load of 96 lb./day contributed by the discharge of two drift mines. These acid load figures though are misleading because sampling station #117A was only monitored during the last four sampling periods after discovering the discharge. Computing average figures for both stations during the last four months revealed that all the pollution noted at sampling station #117 was accounted for by the drift mine discharges. In fact, 60 percent of the drift mine discharge acid load had been neutralized by the time it reached the mouth of the basin.

Sub-basin 58 - Coal Mining Inventory Maps 23 of 27 and 25 of 27.

Sub-basin 58 has a drainage area of 131 acres. No pollution sources are present within this basin and flows are handled by the storm sewer system. Thus, no further investigation was necessary.

Sub-basin 59 - Coal Mining Inventory Map 23 of 27.

Sub-basin 59 is a drainage area north of Nanty Glo encompassing 1,094 acres. Four sampling points were established within the basin for a progressive breakdown of pollution loads. Sampling station #121 was positioned slightly upstream of the mouth of the sub-basin. At this location the pH fluctuated between 5.0 and 4.0 and an average net acid load of 84 lb./day was noted. Station #122 monitored the eastern tributary of the sub-basin at which an average net acid discharge of 61 lb./day and pH ranging from 4.8 to 3.2 were measured. Station #122A, positioned at the mouth of the western tributary, had a pH ranging from 5.0 to 3.7 and an average net acid discharge of 90 lb./day. Seepage from mine waste banks D51, D52 and D53, flanked by these tributaries, are directly responsible for these acid loads. Evidence for this conclusion is substantiated by the nearly neutral water quality of sampling station #122B upstream of these sources.

Sub-basin 60 - Coal Mining Inventory Maps 25 of 27 and 26 of 27.

Sub-basin 60 lying southwest of Nanty Glo drains an area of 818 acres. This area is badly polluted by three individual sources whose cumulative effects were monitored at the mouth of the sub-basin via sampling station #120. At this point a pH of between 2.9 and 2.4 and average net acid load of 22,509 lb./day were noted. Approximately 58.7 percent of this total load is directly attributable to mine waste dump D3 sampled at station #119 where a pH fluctuating from 2.9 to 2.4 and average net acid discharge of 13,223 lb./day were measured. The Webster No. 14 mine of the Pennsylvania Coal and Coke Co., monitored by sampling station #119A, was responsible for another 16.8 percent (3,788 lb./day) of the pollution measured within the sub-basin. Mine waste dump D4 contributed the remaining approximate 24.4 percent or 5,498 lb./day net acid. This contribution was calculated by subtracting the loads of mine dump D3 and the Webster No. 14 mine from the total at the mouth of the sub-basin. Mine dump D4 is presently being reprocessed by Universal Minerals, Inc. with mine dump D3 slated to follow (Mining Permit #1116-1, Drainage Permit #4274SM2).

Sub-basin 61 - Coal Mining Inventory Maps 25 of 27 and 26 of 27.

Sub-basin 61 drains the area north of Mundys Corner with 782 acres. Two regular sampling stations had initially been established with one being eliminated and replaced toward the end of the project. Sampling station #123 was located near the headwaters of the sub-basin just downstream of mine waste dump D47. Only a slight average net acid discharge of 3 lb./day was contributed by this waste material with the pH ranging between 6.8 and 4.5, Sampling station #5189 corresponded to the treated discharge of an acid mine drainage treatment facility operated by Bethlehem Mines Corporation for their Nanty-Glo #31 mine. The effluent of this mine is pumped from a shaft out of the Blacklick Creek watershed boundary located SE of Mundys Corner and then piped to this facility. An average net acid load of 1,046 lb./day and pH ranging between 9.2 and 4.1 were measured at this location based on seven periods of sampling. This seemingly high average contribution figure was biased by one test run result of 10,153 lb./day possibly indicating a momentary malfunction of the facility. Otherwise, an average alkaline condition would have resulted. This sampling station was replaced by station #124 just above the mouth of the sub-basin. Based on the last four sampling runs, an average net alkaline load of 312 lb./day and pH between 6.5 and 5.8 resulted. Thus, no serious pollution problems exist within the area provided the treatment facility is operating properly.

Sub-basin 62 (Unpolluted) - Coal Mining Inventory Maps 26 of 27 and 27 of 27.

The watershed of Stewart Run corresponds with the limits of sub-basin 62 with a drainage area of 3,602 acres. The unpolluted water quality of this area is indicated by the test results of sampling station #125 located slightly above the mouth of the sub-basin where an old

railroad grade crosses the stream. At this point an average net alkaline load of 673 lb./day and pH fluctuating between 6.9 and 5.2 were measured.

Sub-basin 63 - Coal Mining Inventory Maps 23 of 27 and 26 of 27.

Sub-basin 63 drains an area of 1,156 acres monitored by sampling station #126 just upstream of the mouth. Though an average net acid load of 78 lb./day and pH ranging between 5.0 and 4.0 were measured at this point, these conditions are considered as being natural in origin lacking any pollution sources within this vicinity.

Sub-basin 64A (Unpolluted) - Coal Mining Inventory Maps 21 of 27, 23 of 27 and 24 of 27.

Sub-basin 64A corresponds with the watershed of Williams Run draining an area of 4,858 acres. Sampling station #130, located at the Cambria and Indiana railroad trestle crossing Williams Run, was indicative of the good water quality for this area. At this station the pH ranged between 7.2 and 5.5 with an average net alkalinity of 999 lb./day.

Sub-basin 76 - Coal Mining Inventory Maps 22 of 27, 23 of 27, 25 of 27 and 26 of 27.

Sub-basin 76 constitutes all the direct valley wall drainage into South Branch Blacklick Creek from Vintondale to just upstream of the mouth of sub-basin 63. This involves an area of 3,017 acres. Three sampling stations were located on the south branch main stream within these limits to measure cumulative pollution effects. Sampling station #106A was established at the bridge west of Vintondale (map 25 of 27) just upstream of the confluence of south and north branches Blacklick Creek. Regrettably, late in the sampling program it was found that the samples for this station had not been representative of the real water quality. Insufficient mixing just upstream resulted in a much higher acidity on the north side of the channel where sampling was normally done. Strategically sampling the stream at this station, on one occasion in five places across its cross-section, showed that an exaggeration in acidity of 1,782 times the average would have resulted in taking a single sample at the normal position on the north side of the stream. In order to compute a more accurate average acid load figure for this station, the average acid load figure for this station, the average acid loads of sub-basins 43 through 48 and discharges within sub-basin 75 near sub-basins 45 and 46 were subtracted from the average acid load at sampling station #66A. The resultant acid load figure for station #106A was 96,362 lb./day in contrast to the biased figure of 174,080 lb./day of the regular sampling data. This 96,362 lb./day figure agrees well with a calculation to correct this biased figure ($174,080/1.782 = x/1.0$, $x = 97,688$ lb./day) based on the exaggeration ratio.

Sampling station #110B (map 22 of 27) had been established slightly further upstream of station #106A on South Branch Blacklick Creek just above the mouth of sub-basin 53. At this point the pH ranged

between 4.4 and 3.5 and an average net acid load of 21,335 lb./day was measured. Sampling station #110A was located on the main stream above mine waste banks D38, D39 and D40 (map 22 of 27) and midway between the mouths of sub-basins 54 and 55. An average net acidity of 19,518 lb./day and pH range from 4.5 to 3.6 were noted here.

Additional sampling stations within the limits of sub-basin 76 measured drift mine discharges and seepage from mine waste banks and are listed accordingly:

DRIFT MINE DISCHARGES

<u>Station</u>	<u>pH max.</u>	<u>pH min.</u>	<u>Average net acid load</u>
106B	3.4	2.5	14,012 lb./day (map 22 of 27)
4542	2.9	2.6	1,180 lb./day (map 25 of 27)
111D	3.0	2.5	339 lb./day (map 22 of 27)
4794	3.1	2.6	111 lb./day (map 25 of 27)
111C	2.9	2.4	55 lb./day (map 22 of 27)
4750	2.7	2.2	45 lb./day (map 25 of 27)
111B	3.0	2.8	42 lb./day (map 22 of 27)
111A	3.2	2.8	37 lb./day (map 22 of 27)

MINE WASTE DUMP DISCHARGES

D4 mine dump (map 26 of 27)

<u>Station</u>	<u>pH max.</u>	<u>pH min.</u>	<u>Average net acid load</u>
5040	2.9	2.5	289 lb./day
5039	2.7	2.3	284 lb./day
			573 lb./day total

D49 mine dump (map 22 of 27)

<u>Station</u>	<u>pH max.</u>	<u>pH min.</u>	<u>Average net acid load</u>
111E	3.0	2.4	101 lb./day
(111B + 111C drifts)		Subtract	97 lb./day
			4 lb./day

D56 and D57 mine dump (map 26 of 27)

<u>Station</u>	<u>pH max.</u>	<u>pH min.</u>	<u>Average net acid load</u>
5043A	5.2	2.7	10 lb./day total

Some discharges within sub-basin 76 could only be monitored by utilizing the sampling stations directly on the main stream (106A, 110A, 110B) and taking into account any average sub-basin contributions and measured discharges within subbasin 76 draining between these stations.

A neutralization of 4,588 lb./day acid between sampling station #127 of sub-basin 64 and station #110A was noted considering all measured contributions in between as listed below:

Station #127	1,043 lb./day
Sub-basins 55 through 63	22,422 lb./day
Station #5043B	-59 lb./day
Station #5043A	10 lb./day
Station #5043	-21 lb./day
Station #5040	289 lb./day
Station #5039	284 lb./day
Station #111A	37 lb./day
Station #111E	<u>101</u> lb./day
Total of measured discharges	24,106 lb./day
Station #110A	<u>19,518</u> lb./day
	4,588 lb./day neutralized

The above reduction is believed attributable to discharge of domestic waste and the like from the town of Nanty Glo between the two sampling stations.

An average acid load of 526 lb./day was discharged by mine waste dumps D38, D39 and D40 measured by compiling all information between sampling stations #110A and #110B:

Station #110A (above waste dumps)	19,518 lb./day
Sub-basin 54	897 lb./day
Station #111D	339 lb./day
Station #111C	<u>55</u> lb./day
Total of measured discharges	20,809 lb./day
Station #110B (below waste dumps)	<u>21,335</u> lb./day
	526 lb./day excess

Mine dumps D34, D35, and D36, presently being reprocessed by Bentley Coal Co., Inc. of Bentleyville, Pa., contributed a serious average acid load of 58,731 lb./day. This discharge was measured utilizing the information available between sampling stations #110B and #106A:

Station #110B (above waste dumps)	21,335 lb./day
Sub-basins 49 through 53	948 lb./day
Station #4542	1,180 lb./day
Station #4794	111 lb./day
Station #4750	45 lb./day
Station #106B	<u>14,012</u> lb./day
Total of measured discharges	37,631 lb./day
Station #106A (below waste dumps)	<u>96,362</u> lb./day
	58,731 lb./day excess

Discharges from D34 are believed to be constantly fed by subterranean flow associated with the mine complex immediately to the north not measured by sampling station #106B.

Sub-basin 64 - Coal Mining Inventory Maps 23 of 27, 26 of 27 and 27 of 27.

Sub-basin 64 is comprised of all the direct drainage into South Branch Blacklick Creek above the mouth of sub-basin 63 and below the mouth of Williams Run or sub-basin 64A. This involves an area of 2,951 acres. Two monitoring stations were established on the main stream plus another on a small tributary. Sampling station #130A was located on the main stream just above the discharge of the active Bethlehem Mines Corporation acid mine drainage treatment facility for their Revloc #32 and Cambria #33 mines. At this point a pH ranging from 4.5 to 3.8 and average net acid load of 5,083 lb./day were noted (acid load directly attributable to sub-basin 64B). Sampling station #127 lay at the mouth of the sub-basin just upstream of the mouth of sub-basin 63. An average net acidity of 1,043 lb./day and pH which fluctuated from 6.7 to 4.1 were measured at this station. Nearly midway of these locations, sampling station #127A monitored the quality of a tributary stream. A consistent alkalinity averaging 275 lb./day and pH range from 7.3 to 5.2 were noted at this point.

An obvious neutralization of 4040 lb./day acid occurred between stations #127 and #130A.

Sub-basin 64B - Coal Mining Inventory Maps 23 of 27, 24 of 27 and 27 of 27.

Sub-basin 64B is composed of the drainage of South Branch Blacklick Creek above the mouth of sub-basin 64A or Williams Run involving an area of 5,245 acres. Two regular sampling station results show quite clearly the point at which pollution originated within the basin. Sampling station #135 lay on South Branch Blacklick Creek just upstream of its intersection with Route 422. The pH ranged from 6.7 to 5.3 and an average net alkaline load of 583 lb./day was noted at this point. Sampling station #134 though, had been established directly south of Revloc on the main stream catching all seepage from mine waste dumps D1 and D2. A pH ranging from 4.4 to 3.5 and average

net acid load of 7,613 lb./day were measured at this point. The actual contribution in acidic seepage from the two mine waste banks is calculated noting the differences in stream quality between these two sampling stations. The resultant figure, 8,196 lb./day, may in fact be even higher lacking information about the intermediary stream heading northwest from the Mylo Park area.