BROWNS RUN
WARREN COUNTY

STREAM REDESIGNATION EVALUATION REPORT
WATER QUALITY STANDARDS REVIEW

Segment: Basin

Drainage List: Q

Stream Code: 56497

WATER QUALITY MONITORING AND ASSESSMENT SECTION (DSB)
DIVISION OF WATER QUALITY ASSESSMENT AND STANDARDS
BUREAU OF WATER SUPPLY AND WASTEWATER MANAGEMENT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

OCTOBER 1998
Revised September 2002

GENERAL WATERSHED DESCRIPTION

Browns Run is located in northwestern Pennsylvania and is tributary to the Allegheny River at river mile 191.67 (Figure 1). The 24.1 mi^2 basin encompasses portions of Mead and Pleasant Townships in central eastern Warren County. The northernmost portion of the basin lies due south of the city of Warren and the southern extent lies immediately south of Clarendon Heights. No towns are located along the eastern and western basin peripheries. Browns Run and its tributaries traverse a total of 30.7 stream miles. The major subbasins include Dutchman Run (11.5 mi.) and Morrison Run (6.9 mi.). According to the Pennsylvania Gazeteer of Streams, the Browns Run basin contains nine named and unnamed tributaries. An estimated $Q_{7\text{-}10}$ of 2.0 cubic feet per second for Browns Run was accessed from United States Geological Survey gage #03012580 located 300 feet below Morrison Run.

The Browns Run basin currently has the protected water use designation Cold Water Fishes (CWF), in the Water Quality Standards (Chapter 93), Drainage List Q. The basin was evaluated in response to a request from the Pennsylvania Fish and Boat Commission (PFBC) who requested that the stream be redesignated High Quality - Cold Water Fishes (HQ-CWF). Central office staff conducted the initial field survey of the Browns Run basin in April 1994. Four stations in the Cathers Run basin were sampled at the same time and used as reference stations. A report was submitted to the EQB for proposed rulemaking in January 1997. During the public comment period objections were raised to the original recommendation for an Exceptional Value Waters (EV) designation for the majority of the basin. These objections were based in part on the HQ-CWF designation of Cathers Run. This stream was chosen as a reference stream because it is part of the reference network within the Water Quality Network (WQN) which is Pennsylvania's routine surface water quality monitoring system. This reference network contains streams that have been minimally affected by human activities. The Department agreed to resurvey Browns Run and compare it to a higher quality reference stream. This second field survey was conducted June 2-4, 1998. Station locations for the latter survey are detailed in Figure 1 and Table 1.

The Allegheny National Forest encompasses 59% (46,549 acres) of the land in Mead and Pleasant Townships and comprises approximately one-half of the Browns Run basin. Intensive oil and gas extraction is occurring throughout the forested areas of the basin. Agricultural and cleared land is the second largest land use, accounting for 22% of the land in these townships. Some small commercial properties are located in the basin such as the Allegheny Tool Company and Rite Lite Corporation, but no major industries are present. Both PA Route 6 and the Penn Central railroad bisect the watershed in a north/south direction. The residential areas in the basin tend to be clustered along PA Route 6. According to 1990 census data, the population of Mead Township is 1579 and Pleasant Township is 2663. It is estimated that the Browns Run basin contains approximately 486 people, with the vast majority residing in Mead Township. The county controls land use in both townships through zoning ordinances. The county has also enacted a subdivision ordinance that requires a minimum 20,000 ft^2 lot size with 100 feet of road frontage.

Access throughout the watershed is possible through township roads, forest roads, and state highways which are located along the valley bottoms adjacent to the creeks. Basin elevations range from 1180 feet to 2060 feet. Topography and surface features are portrayed on the Warren, Clarendon, and Cornplanter Bridge 7.5 minute series USGS quadrangles.

The majority of the wetlands within the basin are palustrine forested wetlands comprised of broad-leaved deciduous or needle-leaved evergreen flora and are temporary in nature. Also present in the basin are some palustrine open water wetlands that are intermittently exposed to permanent. Included in this group are beaver ponds and the Pennsylvania American Water Company reservoir on Morrison Run.

WATER QUALITY AND USES

Surface Water:

No long term water quality data were available to allow a direct comparison to water quality criteria. Grab samples were collected at 12 stations in the Browns Run basin during the June 1998 survey (Table 2). Results from these samples show elevated levels of cadmium (Cd) at Station 12MR, copper (Cu) at Station 11UT, and alkalinity levels below 20 mg/l at 5 of the headwater stations. The low alkalinities are attributable to natural geologic conditions and possible impacts from acid precipitation. Bacteriological sampling revealed fecal coliform levels ranging from 10 to 12,000 colonies/100 ml. All stations yielding high coliform counts contained a significant quantity of residential development upstream of the sampling site which could be responsible for the high bacterial levels. The instantaneous nature of grab samples precludes comparison to applicable water quality criteria. The indigenous aquatic community is a better indicator of long term conditions and is used as a measure of ecological significance.

There are 4 permitted NPDES discharges within the basin (Table 3). Permitted facilities include the Church of Jesus Christ of Latter Day Saints in Mead Township which discharges to Morrison Run (Permit 9PA0101311). This facility is permitted for .0018 mgd. Permit #PA0102342 was issued to the Penn View Motel in Mead Township which discharges to Morrison Run. It has an average monthly discharge limit of 0.00148 mgd. The Wilderness Mobile Home Park in Pleasant Township, which also discharges to Morrison Run, has a permitted average monthly flow of 0.02 mgd (Permit #PA0101737). The last permitted facility is the Fox Trailer Court in Mead Township which discharges an average of .0077 mgd to UNT 56500 to Dutchman Run (Permit #PA0030902). Pennsylvania American Water Company is the only permitted municipal surface water withdrawal present in the basin; it withdraws water from Morrison Run.

Aquatic Biota:

Habitat assessments and biological samplings were conducted at 13 locations during the June 1998 survey. An evaluation of physical habitat assessments for these stations revealed that the majority of the sampling stations possessed optimal habitat for benthic macroinvertebrates and fish (8 stations) with a lesser number (5 stations) possessing suboptimal habitat (Table 4). All the reference stations earned optimal habitat scores. Habitat scores ranged from 146 to 211 for the Browns Run stations. Low scoring parameters included lack of an adequate riparian zone,

vegetative disruptive pressure, and limited velocity/depth regimes. The reference station habitat scores ranged from 203 to 213, with the channel flow status category scoring lowest overall.

Benthos samples were collected from 13 stations in the Browns Run basin (Table 5). All benthic macroinvertebrate samples were collected from the best available habitat. Most stations without obvious habitat or nutrient enrichment problems exhibited tremendous taxa richness; the total number of taxa in the full samples ranged from 14 to 37 with 11 stations possessing 21 or more taxa. The number of Ephemeroptera, Plecoptera, and Tricoptera (EPT) genera present at these stations varied from a low of 2 at Station 9UT to a high of 20 at Station 2FR. The total taxa numbers for the reference stations ranged from 35 to 41. The number of EPT taxa in these reference samples varied from 14 to 19.

Roadways, oil and gas extraction, and timbering represent the potential sources of nonpoint source pollution in the majority of the Browns Run basin. From the water sampling and habitat assessment survey that was performed, none of these activities currently appear to be significantly impacting overall water quality. Problems such as high coliform counts, sediment deposition, and lack of a riparian zone occur along the more developed Rt 6 corridor as a result of increased population density (9UT, 10DR, and 11UT). The potential exists for movement of road salt and toxics into the stream in areas of bridge overpasses.

Waters in all portions of the basin were found to support their designated uses except for two Unnamed Tributaries to Dutchman Run (56500 and 56501). These streams were considered impaired based on the benthic macroinvertebrate community and the physical habitat. Since 1963, the fish population in the mainstem of Browns Run has been surveyed by the PFBC, the United States Fish and Wildlife Service (USFWS), and the Department (Table 6). The USFWS assessed the fish assemblage in 1963. They found six species including brown and brook trout 1.5 miles upstream of the mouth. In 1980, the USFWS compiled all the fish data from 1963-80 for a catchable trout evaluation. This list was comprised of ten species which included brown, brook, and rainbow trout. In 1980 and 1989 the PFBC electrofished Browns Run above the confluence with Dutchman Run. Again, three trout species were collected along with several species of dace, suckers, darters, and a sculpin species. The Department's latest electrofishing effort occurred April 26-28, 1994. Six stations were electrofished yielding a total of ten species. Brown trout were collected from five of the stations and brook trout were present at four stations. Natural reproduction was evident throughout the basin. Brook trout ranged in size from one inch to approximately seven inches, while brown trout ranged from one inch to approximately eighteen inches.

No portion of the Browns Run basin is a Class A Wild Trout Water or a wilderness trout stream. Browns Run is stocked with 900 rainbow trout from Hook Run to the mouth.

NATIONAL, STATE, REGIONAL, OR LOCAL SIGNIFICANCE

No portion of the Browns Run basin possesses attributes that qualify as outstanding, national, state, regional, or local resource waters under the Department's regulatory criteria.

ECOLOGICAL OR RECREATIONAL SIGNIFICANCE

Benthic macroinvertebrate samples from 13 stations in the Browns Run basin were compared to reference stations of similar drainage area using a modification of EPA's Rapid Bioassessment Protocol III (RBP) (Tables 7 and 8). The reference stations were sampled at the same time as the candidate stream and are located in the same subecoregion (64d). The Browns Run stations were compared to three stations within the East Hickory Creek watershed in Warren County. The best available habitat was sampled in all cases. The metrics used for comparison included taxa richness, modified EPT (number of Ephemeroptera, Plecoptera and Tricoptera taxa), modified Hilsenhoff Biotic Index, percent dominant, and percent modified mayflies. Based on these comparisons all stations in the Browns Run basin upstream of the confluence with Dutchman Run (1BR, 2FR, 3BR, 4HR, and 5BR), the headwaters of Dutchman Run (6DR), Unnamed Tributary 56502 (8UT), and two stations on Morrison Run (12MR and 13MR) have biological condition scores greater than 92% of the reference station score. Scores from the remaining stations are less than 83% of the reference station score and consequently do not meet the regulatory threshold for redesignation as HQ-CWF waters. The least sensitive sample was collected from station 11UT, its Hilsenhoff score of 7.3 was due in large part to the high quantity of oligochaetes and midges in the subsample. This station was located downstream of the Fox Trailer Court mobile home park which discharges into the unnamed tributary.

PUBLIC RESPONSE AND PARTICIPATION SUMMARY

As noted earlier, Browns Run was initially surveyed in 1994 and the Department submitted a report and recommendation for redesignation to the EQB in January 1997. In response to the high level of concern expressed during the public comment period on that proposed rulemaking, the EQB held a public hearing to receive additional comments. The hearing was held July 1, 1997 at the Warren County Courthouse in Warren. The testimony at the hearing centered around the potential economic impacts of an EV designation, the potential impact on a proposed sewer system to serve portions of the watershed, the loss of private property rights, and the quality of the reference stations used for comparison to Browns Run. As a result of the testimony, the Department agreed to re-evaluate the basin.

The Department provided public notice of the re-evaluation to and requested any technical data from the general public through publication in the Pennsylvania Bulletin on December 25, 1999 (29 Pa.B 6524). A similar notice was also published in the Warren Times Observer on December 27, 1999. In addition, Mead Township was notified of the evaluation in a letter dated December 23, 1999. The Warren County Planning and Zoning Commission was also notified at the same time. No data on water chemistry, instream habitat, or the aquatic community were received in response to these notices.

The Department sent copies of the draft stream evaluation report to Mead and Pleasant Townships and the Warren County Planning and Zoning Commission on May 19, 2000 requesting any comments by June 23, 2000. Mead Township requested and was granted a 30 day extension to this comment period. Two responses were received during the comment period.

The response on behalf of Mead Township questioned the adequacy of the fishery data, the sensitivity of the habitat assessment, the appropriateness of the reference stream and the potential impacts of the recommendation on the primary industries located within Mead Township. Comments from a citizen also questioned the sensitivity of the habitat assessment and the impact of the recommendation on the socio-economic environment. He also listed several potential sources of nonpoint source pollution in the watershed. Since no new data on Browns Run was submitted, the Department's report was not changed.

The EQB approved the proposed rulemaking on March 20, 2001, and it was published at 31 Pennsylvania Bulletin 2375 (May 5, 2001) with provision for a 45-day comment period that closed on June 19, 2001. A number of requests for a public hearing regarding Browns Run were received during the public comment period. A hearing was scheduled and announced in the Pennsylvania Bulletin on July 21, 2001 (31 PaB 3956), at which time the public comment period was reopened. A public hearing was held in the Warren County Courthouse in Warren on September 4, 2001 and the public comment period closed one week later, on September 11.

Comments were received from 52 commentators and the Independent Regulatory Review Commission (IRRC) as a result of these public comment opportunities. Sixteen comments expressed support for the redesignation. Opposing comments stated concerns with economic impacts and personal rights because of the redesignation, the choice of a reference water, and that redesignation may cause impacts to the water because of increased use. Since no new data on Browns Run was submitted, the Department's report was not changed.

RECOMMENDATIONS

Based on applicable regulatory criteria, the Department recommends the following changes to Chapter 93:

Browns Run basin (source to confluence of Dutchman Run)

- change current CWF designation to Exceptional Value (EV)
- based on biological condition scores greater than 92% of the reference station
- affects 11.8 stream miles

Dutchman Run basin (source to T413 crossing, Mead Township)

- change current CWF designation to EV
- based on biological condition scores greater than 92% of the reference station
- affects 4.5 stream miles

Unnamed tributary to Dutchman Run (56502) basin

- change current CWF designation to EV
- based on biological condition scores greater than 92% of the reference station
- affects 1.4 stream miles

Morrison Run basin

- change current CWF designation to EV
- based on biological condition scores greater than 92% of the reference station
- affects 6.9 stream miles

The remainder of the candidate basin (Dutchman Run basin from T413 to mouth, except UNT 56502 and Browns Run main stem from the confluence of Dutchman Run to the mouth) should retain the current CWF designation, a total of 7.5 stream miles. The Department's recommendation differs from the original PFBC request of HQ-CWF for the entire basin.

FIGURE 1.
STATION LOCATIONS

BROWNS RUN
WARREN COUNTY

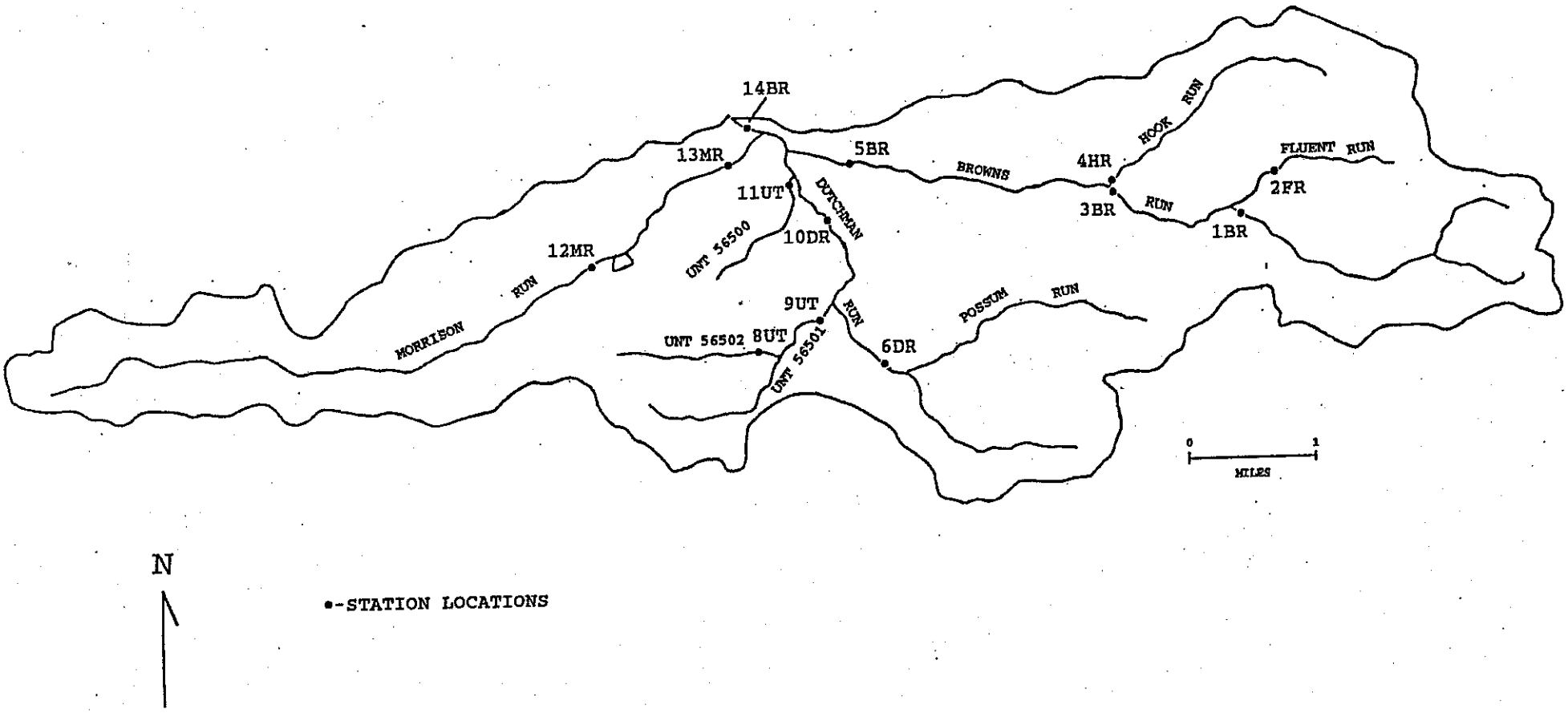

TABLE 1
STATION LOCATIONS
BROWNS RUN
WARREN COUNTY

STATION	LOCATION
1BR	Browns Run approximately 30 meters upstream of confluence with Fluent Run. Mead Township, Warren County Lat: 41 48 48 Long: 79 01 55 RMI: 4.88
2FR	Fluent Run appoximately 20 meters upstream of powerline crossing. Mead Township, Warren County Lat: 41 48 50 Long: 79 01 56 RMI: 0.34
3BR	Browns Run approximately 10 meters upstream of confluece with Hook Run. Mead Township, Warren County Lat: 41 48 55 Long: 79 03 05 RMI: 3.66
4HR	Hook Run approximately 10 meters upstream of the mouth. Mead Township, Warren County Lat: 41 49 00 Long: 79 03 05 RMI: 0.01
5BR	Browns Run approximately 15 meters upstream of T423 crossing. Mead Township, Warren County Lat: 41 49 02 Long: 79 05 14 RMI: 1.20
6DR	Dutchman Run approximately 10 meters upstream of the T413 crossing Mead Township, Warren County Lat: 41 47 44 Long: 79 05 28 RMI: 2.17
8UT	Unnamed tributary 56502 approximately 150 meters upstream of the railroad tracks. Mead Township, Warren County Lat: 41 47 42 Long: 79 06 27 RMI: 0.11
9UT	Unnamed tributary 56501 approximately 10 meters upstream of the T413 crossing. Mead Township, Warren County Lat: 41 47 56 Long: 79 05 57 RMI: 0.21
10DR	Dutchman Run along US Route 6 approximately 1.1 miles downstream of Stoneham. Mead Township, Warren County Lat: 41 48 38 Long: 79 05 52 RMI: 0.76

TABLE 1. (cont)

STATION	LOCATION
11UT	Unnamed tributary 56500 approximately 300 meters upstream of the mouth. Mead Township, Warren County Lat: 41 48 58 Long: 79 06 12 RMI: 0.17
12MR	Morrison Run approximately 300 meters upstream of the resevoir. Mead Township, Warren County Lat: 41 48 21 Long: 79 08 02 RMI: 1.92
13MR	Morrison Run approximately 300 meters upstream of the railroad trestle. Mead Township, Warren County Lat: 41 49 02 Long: 79 06 40 RMI: 0.41
14BR	Browns Run approximately 200 meters downstream of the SR 59 bridge. Mead Township, Warren County Lat: 41 49 22 Long: 79 06 40 RMI: 0.20
R1	Jacks Run approximately 50 meters upstream of the mouth. Limestone Township, Warren County Lat: 41 40 00 Long: 79 19 08 RMI: 0.01
R2	East Hickory Creek approximately 50 meters upstream of the confluence with Middle Hickory Creek. Limestone Township, Warren County Lat: 41 39 39 Long: 79 18 57 RMI: 8.65
R3	East Hickory Creek approximately 5 meters upstream of the Forest Road 119 bridge Limestone Township, Warren County Lat: 41 38 30 Long: 79 20 17 RMI: 6.70

TABLE 2

WATER CHEMISTRY[1]

BROWNS RUN, WARREN COUNTY

JUNE 2-3, 1998

STATION	2FR	3BR	4HR	5BR	6DR	8UT	9UT	10DR	11UT	12MR	13MR	14BR
Field Parameters												
Temp (°C)	10	10.5	10.1	11	11.6	10.7	12.4	12.8	15.8	12.4	14	15.8
pH	7.3	7.2	7.1	6.5	6.3	7.5	6.9	7.1	7.3	7.5	7.7	7.4
Cond (µmhos)	41	52	46	81	42	45	262	177	154	95	102	119
Diss. O_2	9.9	11.4	10.8	11.8	9.0	8.7	8.6	8.5	7.6	8.6	8.8	10.0
Laboratory Parameters												
pH	6.3	6.5	6.2	6.5	6.5	6.2	6.6	6.8	6.7	6.6	6.7	6.7
Alkalinity	8.2	13.8	6.6	17	26	7.2	34	40	40	24	30	28
Acidity	0	0	0	0	0	0.8	0	0	0	0	0	0
Hardness	14	14	15	22	16	14	55	44	29	21	24	28
T Diss. Sol.	34	30	28	36	150	36	180	102	90	54	62	70
Susp.Sol.	<2.0	<2.0	<2.0	<2.0	28.0	8.0	14.0	6.0	16.0	8.0	8.0	6.0
NH_3-N	<.02	<.02	<.02	<.02	<.02	<.02	0.16	0.05	0.15	<.02	<.02	<.02
NO_2-N	<.01	<.01	<.01	<.01	<.01	<.01	0.01	0.01	0.02	<.01	<.01	<.01
NO_3-N	0.24	0.23	0.26	0.23	0.29	0.16	0.45	0.35	1.4	0.16	0.14	0.24
Total P	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	0.02	0.18	0.02	0.02	<0.02
Ca	3.39	3.69	3.12	5.66	6.24	3.46	18.5	14.2	12.3	6.01	6.96	8.9
Mg	1.57	1.54	1.58	2.20	2.60	1.65	5.31	4.56	4.45	2.17	2.69	3.18
Cl	1.0	2.0	3.0	6.0	3.0	2.0	58.0	19.0	10.0	7.0	9.0	10.00
SO_4	12	13	<10	11	<10	13	<10	<10	21	<10	11	11
As*	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
As Diss	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Cd*	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.71	< 0.2	< 0.2
Cd Diss	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
hex Cr*	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cr*	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cu*	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	4.8	14.0	< 4.0	< 4.0	< 4.0
Cu Diss	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Fe*	90	162	112	126	560	217	1020	428	529	221	441	288
Pb*	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Pb Diss	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Mn*	10	15	12	12	35	26	271	52	120	28	35	29
Ni*	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Ni Diss	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Zn*	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	8.6	7.7	6.4	6.5	< 5.0	8.4	< 5.0
Zn Diss	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	5.4	< 5.0	< 5.0	5.0	< 5.0	< 5.0	< 5.0
Al*	73.4	76.9	116	68.3	229	121	182	137	92.6	83.5	119	75.2
fecal coliforms	###	###	###	70	80	###	12000	1200	1500	###	10	340

[1] - Except for pH & conductance and indicated otherwise, all values are total concentrations in mg/l

* - Total concentrations in µg/l

TABLE 3

NPDES PERMITTED DISCHARGES

Browns Run (56497)
Warren County

FACILITY NAME	PERMIT NUMBER	TOWNSHIP	COUNTY
Church of Jesus Christ of Latter-day Saints	PA0101311	Mead	Warren

TYPE OF DISCHARGE	PERMITTED FLOW
Sewage Permit	0.0018 mgd

LATITUDE	LONGITUDE	STREAM CODE AND NAME
41 49'13"	79 06'34"	56498 Morrison Run unnamed tributary

FACILITY NAME	PERMIT NUMBER	TOWNSHIP	COUNTY
Penn View Motel	PA0102342	Mead	Warren

TYPE OF DISCHARGE	PERMITTED FLOW
Sewage Permit	0.00148 mgd

LATITUDE	LONGITUDE	STREAM CODE AND NAME
41 49'10"	79 06'36"	56498 Morrison Run

FACILITY NAME	PERMIT NUMBER	TOWNSHIP	COUNTY
Wilderness Mobile Home Park	PA0101737	Pleasant	Warren

TYPE OF DISCHARGE	PERMITTED FLOW
Sewage Permit	0.02 mgd

LATITUDE	LONGITUDE	STREAM CODE AND NAME
41 48'05"	79 09'30"	56498 Morrison Run

FACILITY NAME	PERMIT NUMBER	TOWNSHIP	COUNTY
Fox Trailer Court	PA0030902	Mead	Warren

TYPE OF DISCHARGE	PERMITTED FLOW
Sewage Permit	0.0077 mgd

LATITUDE	LONGITUDE	STREAM CODE AND NAME
41 48'54.1"	79 06'11.8"	56500 Dutchman Run unnamed tributary

TABLE 4
HABITAT ASSESSMENT SUMMARY
BROWNS RUN
WARREN COUNTY

HABITAT PARAMETER	CANDIDATE STATIONS[1]													REFERENCE[1]		
	1BR	2FR	3BR	4HR	5BR	6DR	8UT	9UT	10DR	11UT	12MR	13MR	14BR	R1	R2	R3
1. instream cover	16	17	18	17	18	16	17	13	16	15	17	18	14	18	17	17
2. epifaunal substrate	18	18	19	18	18	17	18	11	17	13	18	18	17	17	18	18
3. embeddedness	17	16	17	15	16	13	16	9	16	9	16	17	16	18	17	17
4. velocity/depth	14	14	17	16	17	14	14	12	14	12	13	14	14	14	15	16
5. channel alterations	19	19	19	18	17	18	18	13	15	14	17	16	12	20	20	19
6. sediment deposition	16	15	18	17	16	16	17	16	16	8	17	17	17	18	17	17
7. riffle frequency	18	18	18	18	18	15	17	11	17	12	17	17	16	17	18	16
8. channel flow status	13	13	13	13	12	14	12	17	14	13	12	14	14	13	14	14
9. bank condition	17	16	17	15	17	16	14	14	11	14	14	16	15	17	18	16
10. bank vegetation protection	17	17	18	16	17	16	15	15	12	15	16	16	16	18	19	17
11. grazing/disruptive pressures	19	18	19	18	18	18	19	9	16	16	18	17	12	20	20	17
12. riparian vegetation zone width	19	19	18	19	18	12	19	6	12	13	19	15	8	20	20	19
Total Score	203	200	211	200	202	185	196	146	176	154	194	195	171	210	213	203
Rating	OPT	OPT	OPT	OPT	OPT	SUB	OPT	SUB	SUB	SUB	OPT	OPT	SUB	OPT	OPT	OPT

[1] Refer to Figure 1. and Table 1. for station locations.

TABLE 5

Benthic Macroinvertebrate Result
Browns Run, Warren County
June 2-4, 1998

TAXA	STATION									
	1BR	2ER	3BR	4HR	5BR	6DR	8UT	9UT	10DR	11UT
Ephemeroptera (mayflies)										
Baetidae; *Acentrella*	C	A	A	A	A	A		R		
Baetis				P	P					R
Ephemerellidae; *Dannella*									R	
Drunella	P	P	C		C	A	P			
Ephemerella	P	A	C		A	A	C		C	P
Eurylophella		R								R
Ephemeridae; *Litobrancha*	P									
Heptageniidae;*Epeorus*	C	C	A	R	A	A	VA			P
Heptagenia		C								
Stenacron	P									
Stenonema	C	P	P	R	P	P	P		C	R
Leptophlebiidae; *Habrophlebioides*							P		P	P
Paraleptophlebia	R		C		R	R				
Siphlonuridae; *Ameletus*							P			
Plecoptera (stoneflies)										
Chloroperlidae; *Alloperla*			R		P					
Haploperla	R	P	R			R	C			
Sweltsa		C				R	R		R	
Leuctridae; *Leuctra*	P	C	A	R	C	P	VA	R	P	
Paraleuctra										
Nemouridae; *Amphinemura*	P	C	A	A	C	P	VA		R	P
Peltoperlidae; *Peltoperla/Tallaperla*		P	R	R						
Perlidae; *Acroneuria*			P	P	C	P	C			
Agnetina	P		P							
Perlodidae; *Isoperla*	P	C	P		P	P	C			P
Pteronarcyidae; *Pteronarcys*	R	A	P	P	P	R	P			
Tricoptera (caddisflies)										
Glossosomatidae; *Agapetus*	P	P	P		P	P				
Hydropsychidae; *Diplectrona*	P	A	C	A	P	C	C			P
Hydropsyche	C	P	P	P	A	A		P	A	P
Parapsyche							R			
Lepidostomatidae; *Lepidostoma*	P	C	A	R	P		P			P
Limnephilidae; *Pycnopsyche*	R	R		R						P
Philopotamidae; *Dolophilodes*	A	A	A	P	A					
Wormaldia				R			P			
Polycentropodidae; *Polycentropus*		P	P	R		R	R		R	
Psychomiidae; *Lype*		R		R						
Rhyacophilidae; *Rhyacophila*	P	C	P	R	P	P	C		P	
Uenoidae; *Neophylax*					R	P	P			

TAXA	STATION									
	1BR	2FR	3BR	4HR	5BR	6DR	8UT	9UT	10DR	11UT
Other Insect Taxa										
DIPTERA (true flies)										
Athericidae; *Atherix*			C			R				
Ceratopogonidae	R	R	R					R		
Empididae; *Chelifera*			R			P	P	R	P	
Clinocera										
Hemerodromia									R	
Muscidae								P		
Simuliidae; *Prosimulium*							P			
Simulium	A	C	A		P	P	P	C		P
Tipulidae; *Antocha*			R			P		P	P	
Dicranota	P	A	P		P	R	A	R		P
Hexatoma		P	R	R		R	P			
Limnophila						R	P			
Pseudolimnophila			R							
Tipula	R	R	R		R			P	R	P
Chironomidae	C	A	A	P	A	A	A	VA	A	VA
MEGALOPTERA										
Corydalidae; *Nigronia*									P	
ODONATA (dragon-, damselflies)										
Gomphidae; *Lanthus*	R	P	R	C			R			P
Gomphus										
COLEOPTERA (aquatic beetles)										
Dytiscidae; *Agabus*										R
Elmidae; *Optioservus*						P		R	P	
Oulimnius	P	A	C	C	P	A	VA			R
Promoresia		P	P		R					
Stenelmis								R		
Hydrophilidae										R
Psephenidae; *Ectopria*		P	R			P	R			
Non-Insect Taxa										
Nematoda (round-worms)							R			
Bryozoa										
Oligochaeta					P	C	P	A	C	VA
Decapoda (crayfish)										
Cambaridae					R					
Cambarus	P		P	P		P	P		P	
Gastropoda (univalves, snails)										
Ancylidae; *Ferrissia*						P				
Pelecypoda (bivalve clams)										
Sphaeriidae									R	R
Number of taxa in total sample	29	33	37	23	28	33	33	14	20	22

TABLE 5 (Cont.)

TAXA	STATION					
	12MR	13MR	14BR	R1	R2	R3
Ephemeroptera (mayflies)						
Baetidae; *Acentrella*	P	A	C		A	P
Baetis	R	C	C	A	C	P
Ephemerellidae; *Dannella*	R	R				
Drunella	A	A	P	A	P	A
Ephemerella	A	P	A	A	C	C
Serratella			C	P		A
Ephemeridae; *Ephemera*				R	R	
Heptageniidae;*Epeorus*	C	A	P	C	C	A
Leucrocuta				C	R	
Stenacron					R	
Stenonema		P	P	C	C	C
Leptophlebiidae; *Habrophlebioides*				P	C	P
Paraleptophlebia		A	R			C
Oligoneuriidae; *Isonychia*					C	C
Plecoptera (stoneflies)						
Chloroperlidae; *Alloperla*		R	R			R
Haploperla		P	R	R		
Leuctridae; *Leuctra*	C	A	C		A	A
Paraleuctra				VA		
Nemouridae; *Amphinemura*	C	C	P	C	P	P
Peltoperlidae; *Peltoperla/Tallaperla*				R	R	
Perlidae; *Acroneuria*	R	A	R	A	C	A
Agnetina					R	
Perlodidae; *Isoperla*	C	P		P	P	C
Pteronarcyidae; *Pteronarcys*			R			R
Tricoptera (caddisflies)						
Glossosomatidae; *Agapetus*			P		P	C
Glossosoma				R		P
Hydropsychidae; *Diplectrona*	P	A		A		P
Cheumatopsyche			P		A	P
Hydropsyche		A	A	P	C	A
Lepidostomatidae; *Lepidostoma*		P	R	P	P	
Limnephilidae; *Pycnopsyche*	R			R		
Odontoceridar; *Psilotreta*					R	R
Philopotamidae; *Dolophilodes*		C	C	P	P	VA
Chimarra			R			
Polycentropodidae; *Polycentropus*	P	P	P		P	P
Psychomiidae; *Lype*					R	
Rhyacophilidae; *Rhyacophila*	P	C	P		R	P
Uenoidae; *Neophylax*	R			R		

TAXA	STATION					
	12MR	13MR	14BR	R1	R2	R3
Other Insect Taxa						
DIPTERA (true flies)						
Athericidae; *Atherix*						R
Ceratopogonidae		R				R
Empididae; *Chelifera*	P	R	R			R
Hemerodromia			P			
Simuliidae; *Simulium*	R		P	P	P	P
Tipulidae; *Antocha*	R		C	R	R	P
Dicranota	R	P	R	A	C	P
Hexatoma		R		A	P	C
Tipula	R	R	R	R		
Chironomidae	C	A	A	A	VA	VA
MEGALOPTERA						
Corydalidae; *Nigronia*			R	P	P	P
ODONATA (dragon-, damselflies)						
Aeshnidae; *Boyeria*				R		
Gomphidae				R	P	
COLEOPTERA (aquatic beetles)						
Elmidae; *Optioservus*	A	C	A	R	C	A
Oulimnius	P	P	R	C	P	C
Promoresia			P	P	C	C
Stenelmis			C			C
Psephenidae; *Ectopria*		P				
Psephenus			P		P	P
Ptilodactylidae; *Anchytarsus*						R
Non-Insect Taxa						
Oligochaeta	P	R	P			
Decapoda (crayfish)						
Cambaridae	R	P			R	
Cambarus			P	P		P
Gastropoda (univalves, snails)						
Ancylidae; *Ferrissia*		P				
Number of taxa in total sample	25	32	37	35	38	41

VA = very abundant, > 99 organisms
A = abundant, 25-99 organisms
C = common, 10-24 organisms
P = present, 3-9 organisms
R = rare, < 3 organisms

TABLE 6

FISHES

Browns Run (56497)
Warren County

SPECIES	ELECTROFISHING STATIONS												
	U. S. Fish & Wildlife Service		Pennsylvania Fish & Boat Commission				Dept. of Environmental Resources Stations April 26-28, 1994						
	8/63	1963 -1980	6/80	6/89 1	6/89 2	6/89 3	7/84	3 BR	4 HR	6 DR	10 DR	12 MR	13 MR
Brown trout	X	X	X	X	X	X		X		X	X	X	X
Brook trout	X	X	X	X	X	X	X	X	X	X		X	
Rainbow trout		X	X		X	X							
Bigeye chub	X	X									X		
Blacknose dace	X	X	X		X	X				X	X	X	X
Longnose dace	X	X	X										
Mottled sculpin	X	X	X	X	X	X	X	X	X	X	X	X	X
Creek chub		X			X	X					X		
White sucker		X	X			X					X		X
Fantail darter		X	X										
Johnny darter													X
Golden redhorse						X							
Black redhorse													X
Northern hog sucker						X							
Central stoneroller						X					X		

United States Fish and Wildlife Service –
8/63 – August 2, 1963 sampling station is located approximately 1.5 miles upstream of the mouth of Browns Run and extends downstream for 500 ft.
1963–1980 – 1980 Catchable trout evaluation – included species composition list for Browns Run from 1963 through 1980.

Pennsylvania Fish and Boat Commission –
6/80 – June 19, 1980 sampling of Browns Run. Section 01 limits include:
Station 1 – RMI 5.90, a 355 m length of stream which extends upstream from a jeep trail crossing Browns Run.
Station 2 – RMI 2.90, a 345 m section that originates 1 km downstream from Hook Run.
Station 3 – RMI 0.70, encompasses 366 m and originates 200 m upstream from the Route 59 bridge.
6/89 Section 01 sampled. Station locations for 1, 2, and 3 are the same as the PFBC June 1980 sample sites.

Department of Environmental Resources –
7/84 – PFBC, USFWS, and DER sampled 200 m upstream of mouth on Hook Run on July 19, 1984.

Remaining DER station locations are described on Table 1 and shown on Figure 1

TABLE 7

Semi-quantitative Benthic Macroinvertebrate Data
Browns Run, Warren County
June 2-4, 1998

TAXA	STATION									
	1BR	2FR	3BR	4HR	5BR	6DR	8UT	9UT	10DR	11UT
Ephemeroptera (mayflies)										
Baetidae; *Acentrella*	9	6	13	17	9	12				
Baetis				2						
Ephemerellidae; *Drunella*	1	1	5		1	19				
Ephemerella	2	5	3		17	22	3		9	3
Eurylophella		1								1
Ephemeridae; *Litobrancha*	1									
Heptageniidae;*Epeorus*	3	3	4	1	18	6	20			
Heptagenia		6								
Stenacron	3									
Stenonema	7		4	1	1	1			4	1
Leptophlebiidae; *Habrophlebioides*									1	1
Paraleptophlebia			4							
Plecoptera (stoneflies)										
Chloroperlidae; *Alloperla*			1		1					
Haploperla		1					5			
Sweltsa		5							1	
Leuctridae; *Leuctra*	10	5	12	1	6	2	19			
Nemouridae; *Amphinemura*	1	4	11	16	4		35		1	2
Peltoperlidae; *Peltoperla/Tallaperla*		1		1						
Perlidae; *Acroneuria*				3	7	1	3			
Perlodidae; *Isoperla*	3	5				2	3			
Pteronarcyidae; *Pteronarcys*	1	7	1	1	2		2			
Tricoptera (caddisflies)										
Glossosomatidae; *Agapetus*	3	1	1		1	1				
Hydropsychidae; *Diplectrona*	2	10	6	27	2	3	1			2
Hydropsyche	4	1	2	4	14	11			36	1
Lepidostomatidae; *Lepidostoma*	4	3	8	1	1					
Limnephilidae; *Pycnopsyche*	1									3
Philopotamidae; *Dolophilodes*	10	8	11	5	18					
Wormaldia				1			1			
Polycentropodidae; *Polycentropus*			1	2						
Psychomiidae; *Lype*				1						
Rhyacophilidae; *Rhyacophila*	5	3	1	1	1		4			
Uenoidae; *Neophylax*						2	1			

TAXA	STATION									
	1BR	2FR	3BR	4HR	5BR	6DR	8UT	9UT	10DR	11UT
Other Insect Taxa										
DIPTERA (true flies)										
Athericidae; *Atherix*			1							
Ceratopogonidae			1							
Muscidae								2		
Simuliidae; *Simulium*	26	3	6					3		2
Tipulidae; *Antocha*									1	
Dicranota	1	8			1			1		
Hexatoma		1								
Tipula	1		1						1	
Chironomidae	7	12	25	4	6			107	32	42
ODONATA (dragon-, damselflies)										
Gomphidae; *Lanthus*			1	8						2
COLEOPTERA (aquatic beetles)										
Elmidae; *Optioservus*						1				
Oulimnius	4	22	4	7	2	8	23			
Promoresia		1	1							
Hydrophilidae										1
Psephenidae; *Ectopria*						2				
Non-Insect Taxa										
Nematoda (round-worms)							1			
Oligochaeta					1	4		17	8	46
Decapoda (crayfish)										
Cambaridae			1							
Cambarus	1			3					1	
Pelecypoda (bivalve clams)										
Sphaeriidae									1	

TABLE 7 (Cont.)

TAXA	STATION					
	12MR	13MR	14BR	R1	R2	R3
Ephemeroptera (mayflies)						
Baetidae; *Acentrella*	2	8	6		5	2
Baetis	1	5	3	16	2	1
Ephemerellidae; *Dannella*		1				
Drunella	16	8	2	15		6
Ephemerella	20		10	5	3	4
Serratella			2	1		6
Ephemeridae; *Ephemera*						
Heptageniidae;*Epeorus*	8	7			2	11
Leucrocuta				3	1	
Stenonema		1	1	4	6	4
Leptophlebiidae; *Habrophlebioides*				2	5	1
Paraleptophlebia		9	1			3
Oligoneuriidae; *Isonychia*					2	6
Plecoptera (stoneflies)						
Chloroperlidae; *Alloperla*						1
Haploperla		1				
Leuctridae; *Leuctra*	11	7	2	34	3	7
Paraleuctra						
Nemouridae; *Amphinemura*	10	6	2	5	1	
Peltoperlidae; *Peltoperla/Tallaperla*						
Perlidae; *Acroneuria*	1	8		6	5	3
Agnetina						
Perlodidae; *Isoperla*	7					3
Pteronarcyidae; *Pteronarcys*						
Tricoptera (caddisflies)						
Glossosomatidae; *Agapetus*			1			1
Glossosoma				1		1
Hydropsychidae; *Diplectrona*	4	4		8		
Cheumatopsyche			2		7	
Hydropsyche		5	16		5	6
Lepidostomatidae; *Lepidostoma*		1	1		1	
Philopotamidae; *Dolophilodes*		5	5	3	1	29
Chimarra			1			
Polycentropodidae; *Polycentropus*	2	2	1		1	
Psychomiidae; *Lype*					1	
Rhyacophilidae; *Rhyacophila*	2	3				
Uenoidae; *Neophylax*	2			1		
Other Insect Taxa						
DIPTERA (true flies)						
Ceratopogonidae		1				
Empididae; *Chelifera*	4		1			

TAXA	STATION					
	12MR	13MR	14BR	R1	R2	R3
Hemerodromia			1			
Simuliidae; *Simulium*	1					1
Tipulidae; *Antocha*	1		4			
Dicranota	1	2	1	1	4	2
Hexatoma				2	2	4
Tipula	1					
Chironomidae	6	26	38	26	48	22
MEGALOPTERA						
Corydalidae; *Nigronia*						1
COLEOPTERA (aquatic beetles)						
Elmidae; *Optioservus*	14	4	6		5	7
Oulimnius	1	2			2	4
Promoresia				3	2	3
Stenelmis			6	1		3
Psephenidae; *Ectopria*		2				
Psephenus			1			
Ptilodactylidae; *Anchytarsus*						1
Non-Insect Taxa						
Oligochaeta	3		1			
Decapoda (crayfish)						
Cambaridae		1			1	
Cambarus			1	1		

TABLE 8
RBP METRIC COMPARISON
BROWNS RUN
JUNE 2-4, 1998

METRIC	STATION															
	1BR	2FR	3BR	4HR	5BR	6DR	8UNT	9UNT	10DR	11UNT	12MR	13MR	14BR	R1	R2	R3
1. TAXA RICHNESS	24	25	26	21	20	20	19	5	12	13	22	24	26	20	24	28
Cand/Ref (%)	120	125	108	105	83	100	95	25	50	65	92	100	93	***	***	***
Biol. Cond. Score	6	6	6	6	6	6	6	0	0	2	6	6	6	6	6	6
2. MOD. EPT INDEX	17	19	16	15	16	12	12	0	5	7	11	15	13	12	13	16
Cand/Ref (%)	142	160	123	125	123	100	100	0	38	58	85	115	81	***	***	***
Biol. Cond. Score	6	6	6	6	6	6	6	0	0	2	6	6	6	6	6	6
3. MOD. HBI	3.19	2.61	2.83	2.67	1.77	2.93	2.37	6.50	5.24	7.27	2.38	2.97	4.31	2.53	4.46	2.37
Cand-Ref	0.66	0.08	-1.63	0.14	-2.69	0.40	-0.16	3.97	0.78	4.74	-2.08	-1.49	1.94	***	***	***
Biol. Cond. Score	6	6	6	6	6	6	6	0	4	0	6	6	0	6	6	6
4. % DOMINANT TAXA	24	18	19	25	16	20	25	82	38	43	17	22	33	25	42	20
Cand-Ref	-1	-7	-23	0	-26	-5	0	57	-4	18	-25	-20	13	***	***	***
Biol. Cond. Score	6	6	6	6	6	6	6	0	6	2	6	6	4	6	6	6
5. % MOD. MAYFLYS	23	18	26	18	41	55	17	0	14	5	39	29	19	20	17	29
Ref-Cand	-3	2	-9	2	-24	-35	3	20	3	15	-22	-12	10	***	***	***
Biol. Cond. Score	6	6	6	6	6	6	6	4	6	4	6	6	6	6	6	6
TOTAL BIOLOGICAL CONDITION SCORE	30	30	30	30	30	30	30	4	16	10	30	30	22	30	30	30
% COMPARABILITY TO REFERENCE	100	100	100	100	100	100	100	13	53	33	100	100	73	***	***	***

NOTE: Stations 1BR, 2FR, 4HR, 6DR, 8UT, 9UT, and 11UT compared to R1 Reference Station
Stations 3BR, 5BR, 10DR, 12MR, and 13MR compared to R2 Reference Station
Station 14BR compared to R3 Reference Station