

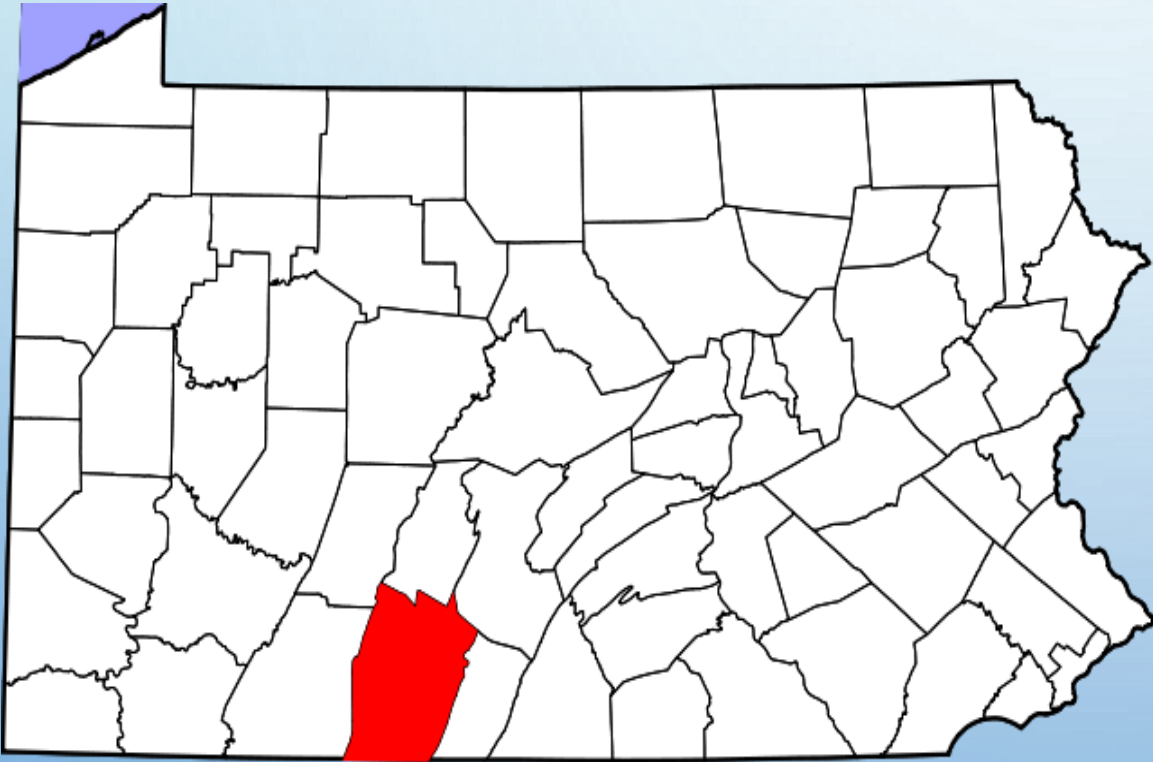
**SUCCESSFUL
ACID MINE
DRAINAGE
ABATEMENT – A
CASE STUDY**

JOE MILLS
SENIOR SCIENTIST

**SKELLY
AND
LOY**

A  **Terracon** Company

**BROAD TOP TOWNSHIP, BEDFORD COUNTY,
PENNSYLVANIA
48.5 SQ. MILES**



1981 WATERSHED STUDY

- PROMPTED BY THE SUCCESS OF A HIGHLY VISIBLE 1979 R.A.M.P. (RURAL ABANDONED MINE PROGRAM) PROJECT
- COMPLETED BY THREE LOCAL CONSERVATION DISTRICTS
- TRASH, SEWAGE & AMD WERE THE LARGEST PROBLEMS OF CONCERN IN THE WATERSHED

ILLEGAL TRASH DUMPING

- **BTT SIGNED A HOST MUNICIPALITY AGREEMENT WITH THE LANDFILL OPERATOR**
- **FREE WEEKLY CURBSIDE GARBAGE PICK-UP**
- **BTT PAID FOR EMPLOYEE'S TIME COLLECTING GARBAGE**
- **FREE, SEMI-ANNUAL BULK ITEM PICK-UP**
- **BTT EMPLOYEE ON SITE DURING OPERATING HOURS**

ILLEGAL TRASH DUMPING

- **\$120 ANNUAL PROPERTY TAX CREDIT**
- **\$5,000 ANNUAL DONATION TO 3 LOCAL VFD**
- **\$3.50/TON, \$200,000 (MINIMUM) ANNUALLY TO BTT**
- **ILLEGAL TRASH DUMPING HAS BEEN MINIMIZED**



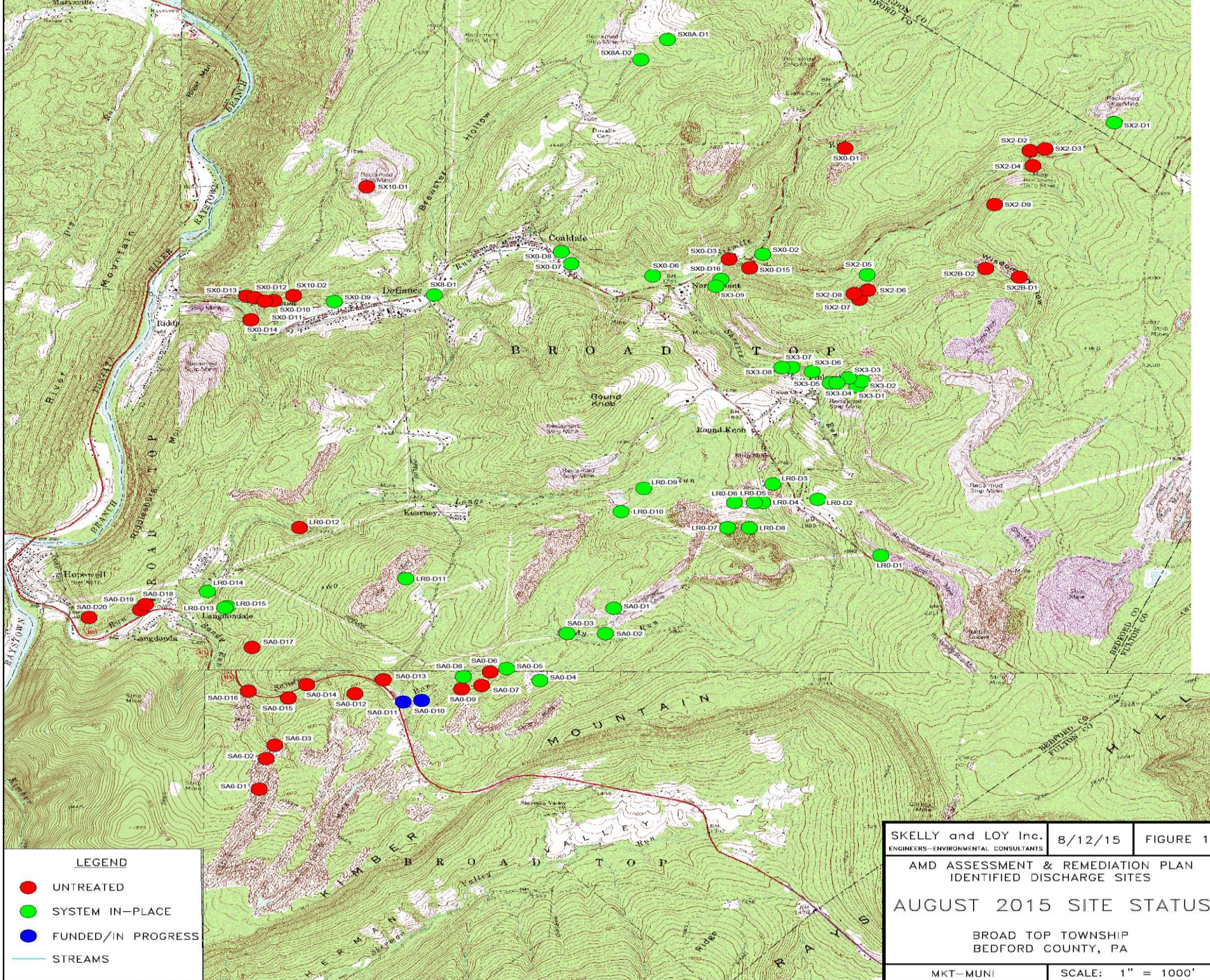
SEWAGE

- 1995 - PA. SEWAGE FACILITIES ACT 537 PLAN COMPLETED, 800 – 850 HOMES
- 4 CLUSTER SYSTEMS TREAT ~600 HOMES / 200 HOMES UTILIZE ON-LOT SYSTEMS, 2-4 HOMES PER SYSTEM
- THE TREATMENT SYSTEMS ARE **OWNED AND MAINTAINED** BY BROAD TOP TOWNSHIP (\$20 MONTHLY MAINTENANCE FEE CHARGED TO EACH HOUSEHOLD)
- US ARMY CORP SECTION 313 PROGRAM MONEY (ENVIRONMENTAL INFRASTRUCTURE) AND OTHER PUBLIC FUNDS WERE UTILIZED
- NITRATE AND BACTERIOLOGICAL ISSUES HAVE BEEN ELIMINATED



ACID MINE DRAINAGE (AMD)

- 1977 – SURFACE MINE CONTROL AND RECLAMATION ACT
- 1979 – FIRST RAMP (RURAL ABANDONED MINE PROJECT) COMPLETED IN BTT
- 1990'S – A FEW RAMP AND PA. BUREAU OF ABANDONED MINE RECLAMATION (BAMR) PROJECTS COMPLETED IN BTT
- 1995 - RAMP NO LONGER FUNDED, STATE AML PROGRAMS
- 2005 – WATERSHED IMPROVEMENT PLAN (WIP) COMPLETED
- SINCE COMPLETION OF THE WIP, >\$3.5 MILLION OF CWA SECTION 319 FUNDS AND >\$0.5 MILLION GROWING GREENER GRANT MONEY (SMCRA TITLE IV) SPENT IN THE WATERSHEDS



LEGEND	
●	UNTREATED
●	SYSTEM IN-PLACE
●	FUNDED/IN PROGRESS
	STREAMS

SKELLY and LOY Inc. ENGINEERS-ENVIRONMENTAL CONSULTANTS	8/12/15	FIGURE 1
AMD ASSESSMENT & REMEDIATION PLAN IDENTIFIED DISCHARGE SITES		
AUGUST 2015 SITE STATUS		
BROAD TOP TOWNSHIP BEDFORD COUNTY, PA		
MKT-MUNI	SCALE: 1" = 1000'	

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The background is a light blue gradient with several realistic water droplets of various sizes scattered in the corners. The droplets have highlights and shadows, giving them a three-dimensional appearance.

CONSTRUCTION CONSTRAINTS









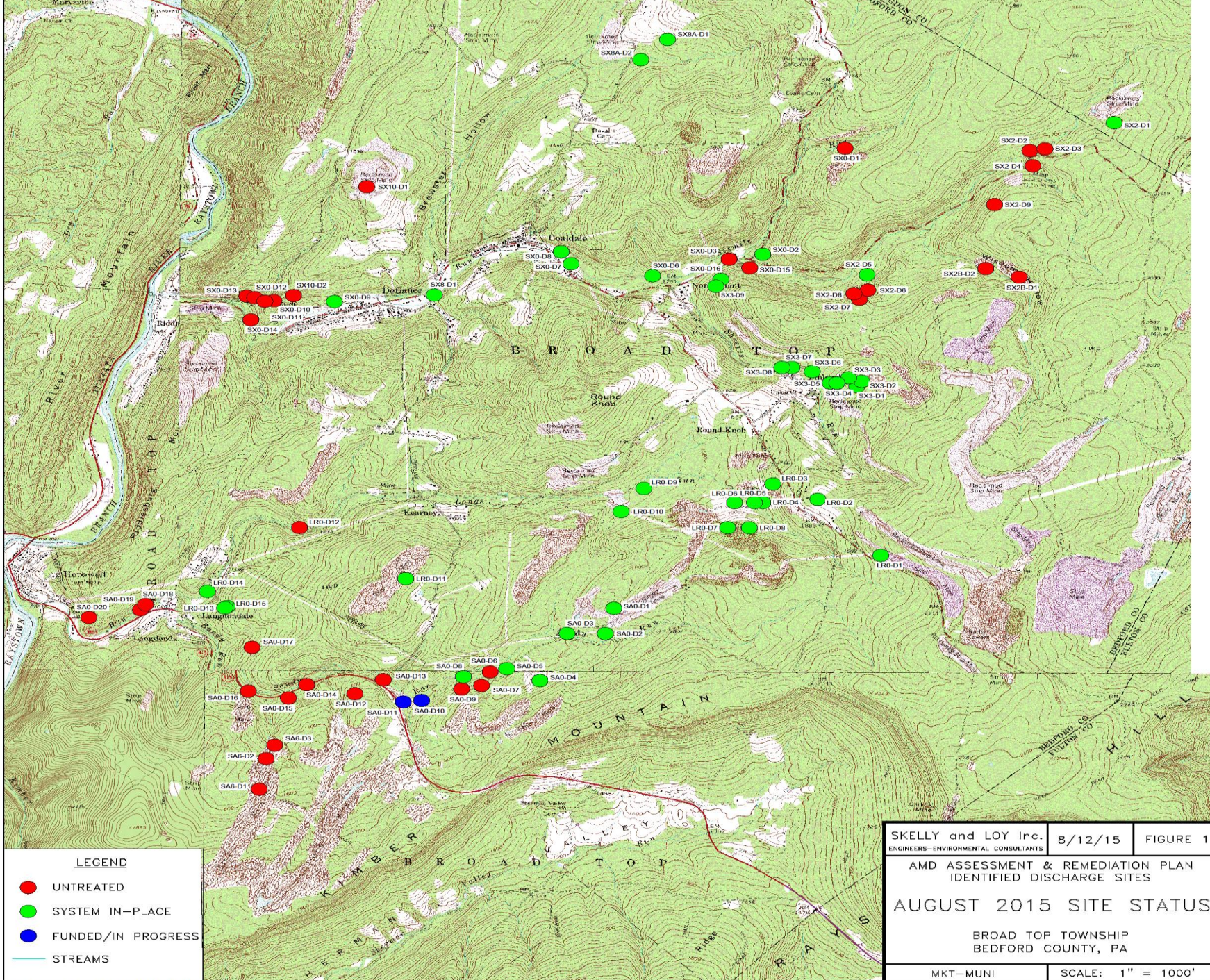






The background is a light blue gradient with several water droplets of various sizes scattered across it. Some droplets are in the top left, some in the bottom right, and some in the center. There are also faint, concentric ripples in the center of the image, suggesting a stone dropped in water.

LONGS RUN



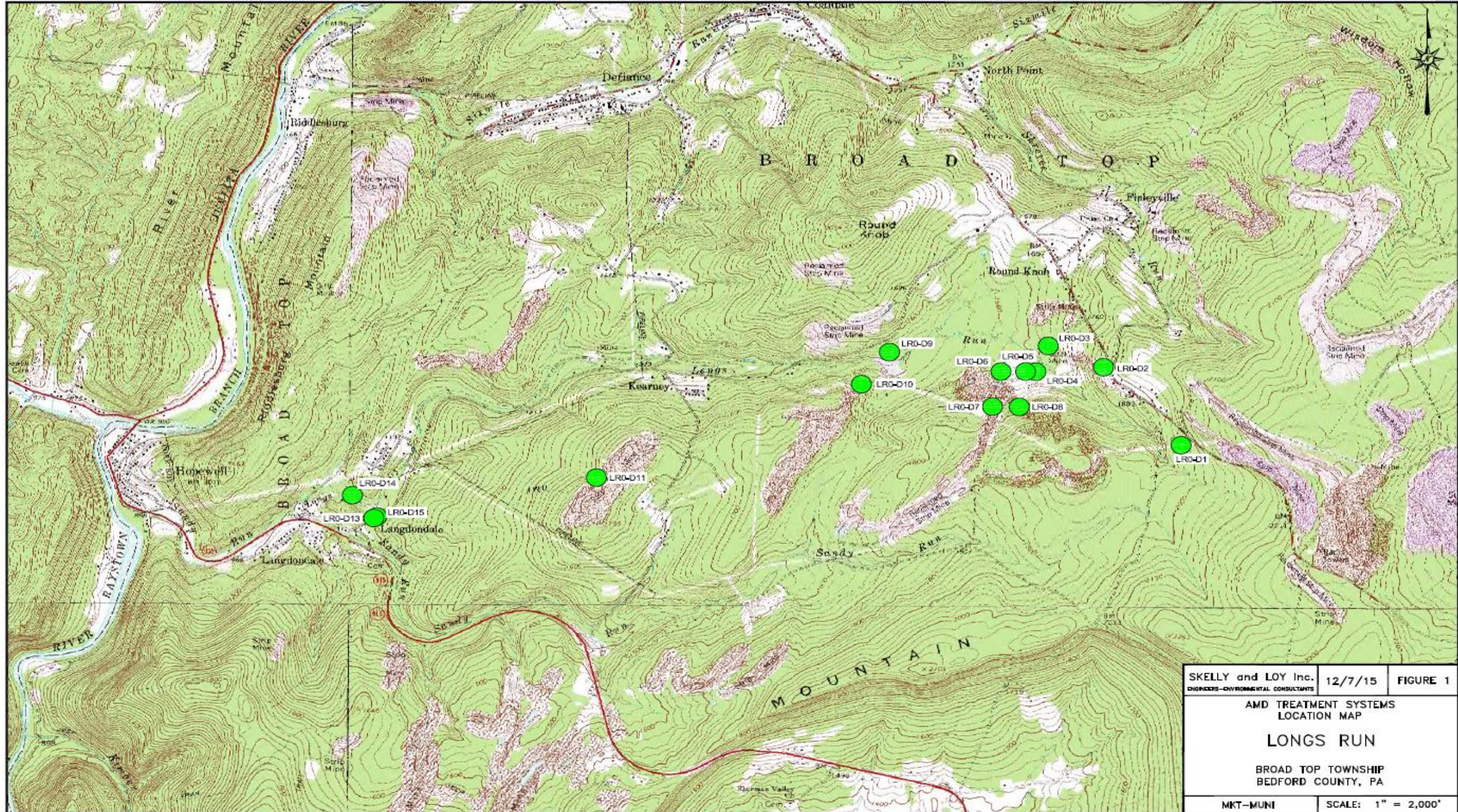
LEGEND	
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LONGS RUN

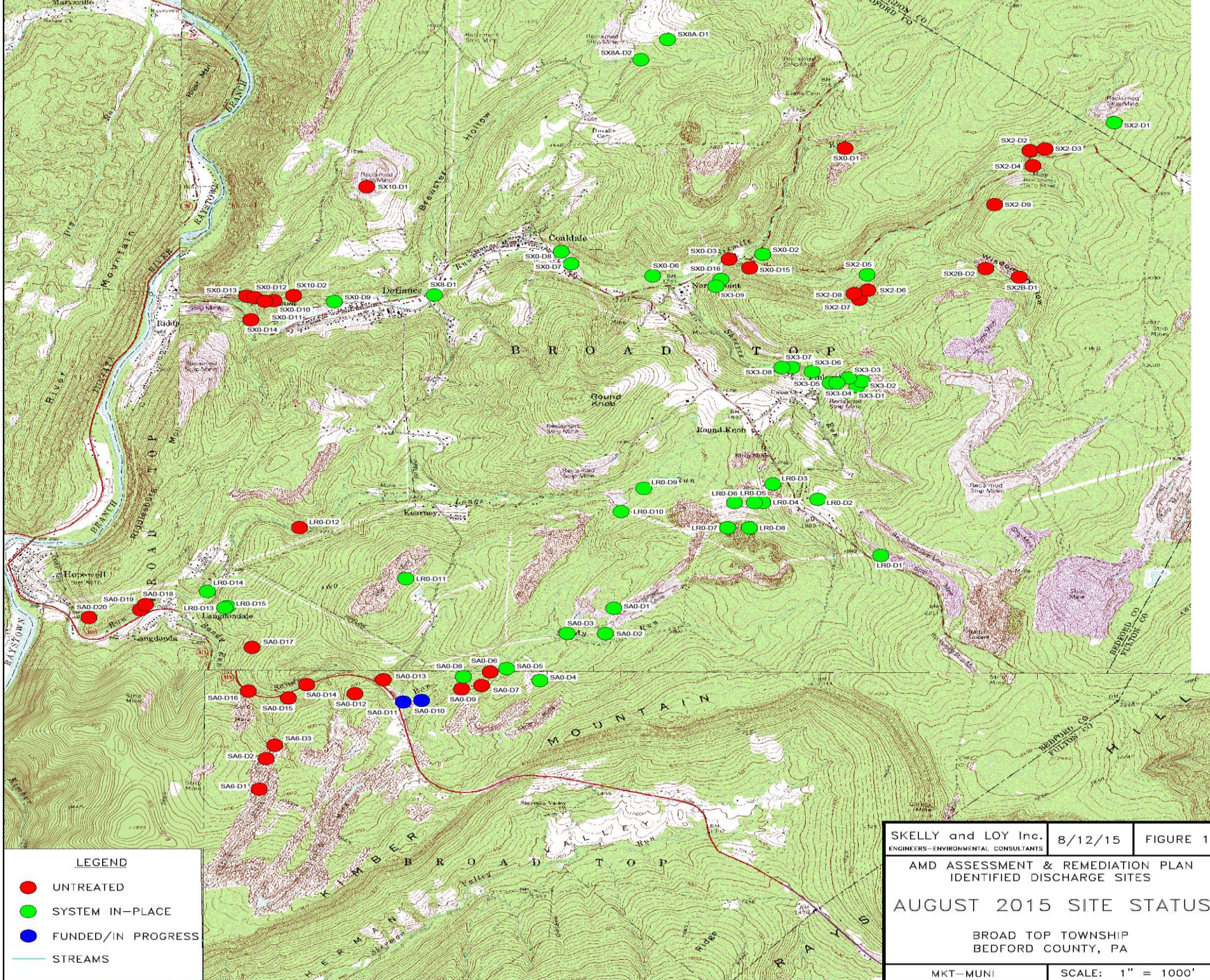
- 5.25-MILE TRIBUTARY TO SANDY RUN
- 13 AMD TREATMENT SYSTEMS
- 2007 FIRST DOCUMENTED FISH
- 2014 DELISTED IN THE PA INTEGRATED WATER QUALITY MONITORING AND ASSESSMENT REPORT (INTEGRATED REPORT) – THINK CWA SECTION 303(D)
- FREESTONE INDEX OF BIOLOGIC INTEGRITY (IBI) SCORE OF 78.3. IBI = 60 IS CONSIDERED TO HAVE ATTAINED COLD WATER FISHERIES STATUS



SKELLY and LOY Inc. ENGINEERS-ENVIRONMENTAL CONSULTANTS	12/7/15	FIGURE 1
AMD TREATMENT SYSTEMS LOCATION MAP		
LONGS RUN		
BROAD TOP TOWNSHIP BEDFORD COUNTY, PA		
MKT-MUNI	SCALE: 1" = 2,000'	

The background is a light blue gradient. There are several realistic water droplets of various sizes in the corners: top-left, top-right, and bottom-right. The droplets have highlights and shadows, giving them a 3D appearance.

SANDY RUN



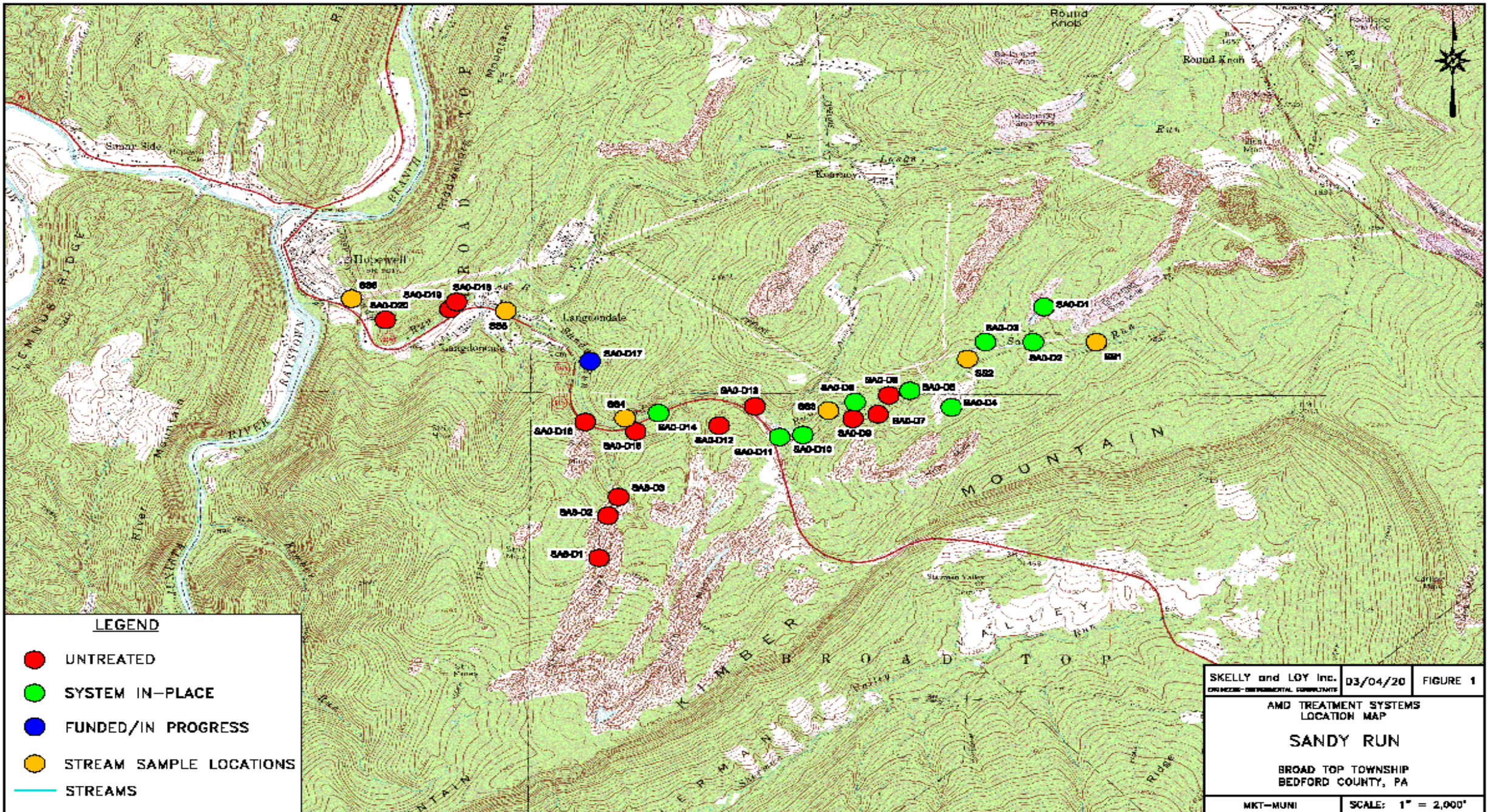
LEGEND	
●	UNTREATED
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	STREAMS

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SANDY RUN

- 5.25-MILES
- FLOWS INTO THE RAYSTOWN BRANCH OF THE JUNIATA RIVER, AT HOPEWELL, PA
- 9 AMD TREATMENT SYSTEMS, 1 SYSTEM UNDER CONSTRUCTION
- 1 UNTREATED, HIGHLY IMPACTED TRIBUTARY, 3 AMD SOURCES
- HEADWATERS: LANDFILL AND COUNTY (DIRT) ROAD = SEDIMENT IMPAIRMENT AND 3 BAMR TREATMENT SYSTEMS IN NEED OF SOME TLC
- BIOLOGICALLY DEPRESSED BASED ON TU STUDIES



LEGEND

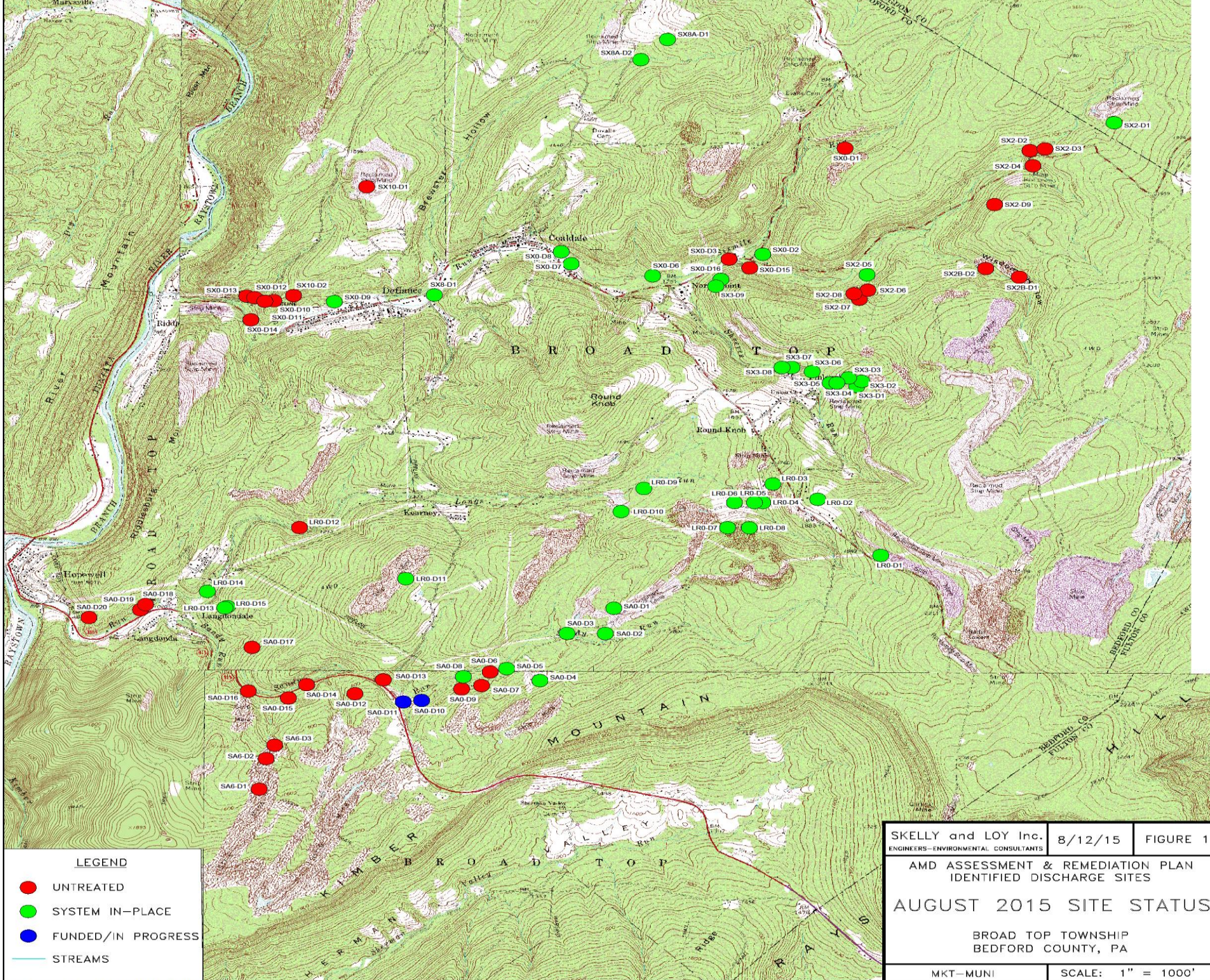
- UNTREATED
- SYSTEM IN-PLACE
- FUNDED/IN PROGRESS
- STREAM SAMPLE LOCATIONS
- STREAMS

SKELLY and LOY Inc. ENGINEERING-ENVIRONMENTAL CONSULTANTS	03/04/20	FIGURE 1
AMD TREATMENT SYSTEMS LOCATION MAP		
SANDY RUN		
BROAD TOP TOWNSHIP BEDFORD COUNTY, PA		
MKT-MUNI	SCALE: 1" = 2,000'	

SANDY RUN, LOW FLOW, AUGUST 2019

AMD Site	pH in	pH out	Fe in	Fe out	Al in	Al out	Acidity in	Acidity out
SAO-D1	2.55	No Flow	9.01	No Flow	7.67	No Flow	98.53	No Flow
SAO-D2	2.97	6.67	14.6	0.88	1.63	<0.1	58.84	-56.65
SAO-D3	5.14	6.27		0.35		0.11		-3.61
SAO-D4	2.28	7.01	75.7	0.354	33.5	<0.1	419.2	-70.31
SAO-D5	2.45	7.24	6.7	0.2	11.5	<0.1	146	-53.46
SAO-D8	3.53	7.75	1.67	0.2	5.69	0.18	55.09	-37.43
SAO-D10	2.67	7.54	10.6	0.2	10.2	0.43	159.3	-51.65
SAO-D11	5.88	7.54	7.79	0.2	<0.1	<0.1	9.91	-33.37
SAO-D14	3.43	6.55	3.01	0.2	6.75	0.31	100.3	-34.73

SIX MILE RUN



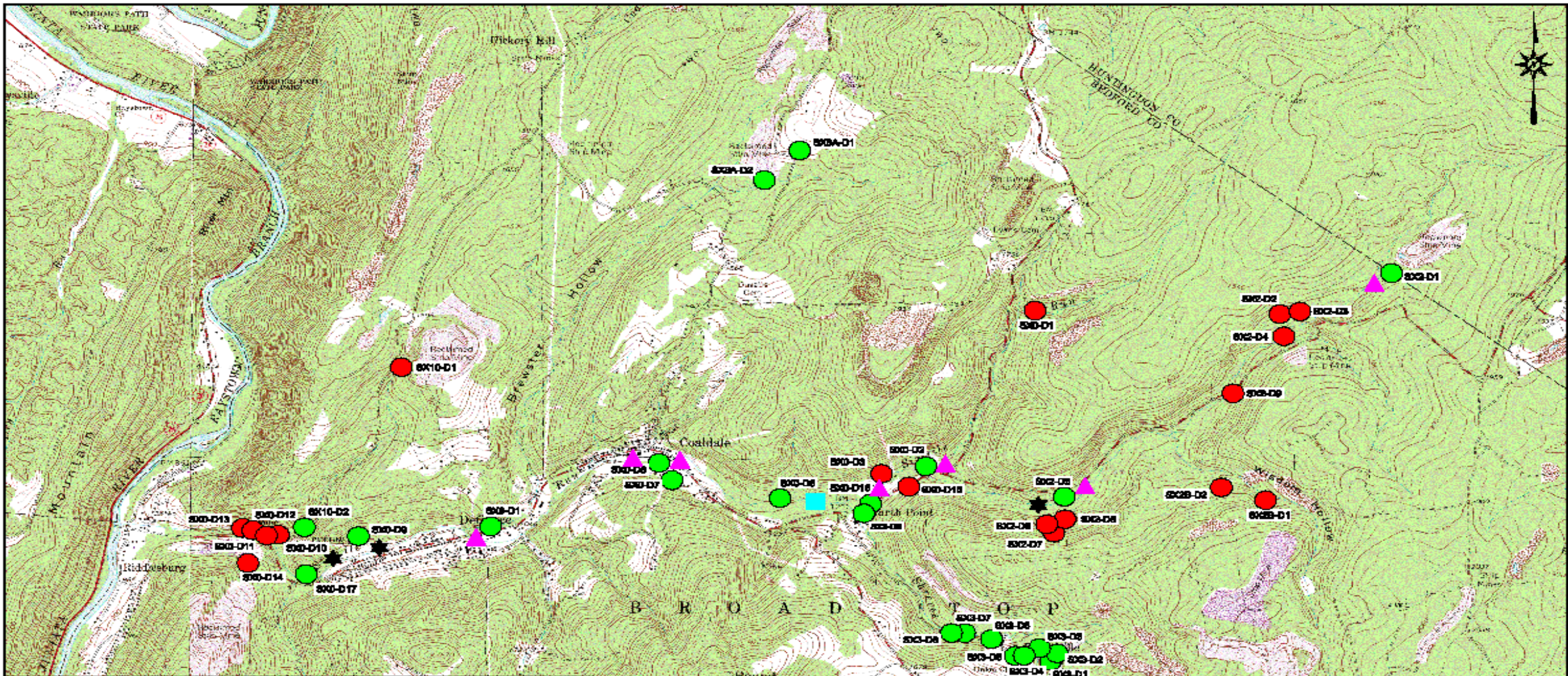
LEGEND	
●	UNTREATED
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SKELLY and LOY Inc. ENGINEERS-ENVIRONMENTAL CONSULTANTS	8/12/15	FIGURE 1
AMD ASSESSMENT & REMEDIATION PLAN IDENTIFIED DISCHARGE SITES		
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SIX MILE RUN

- 6-MILES, FLOWS INTO THE RAYSTOWN BRANCH OF THE JUNIATA RIVER NEAR DEFIANCE, PA
- 20 AMD TREATMENT SYSTEMS, 19 SYSTEMS DISCHARGING > 6.0 PH, ONE SYSTEM DISCHARGING ~ 5.0 DURING HIGH FLOW EVENTS
- MAINSTEM PH BETWEEN 6.0 AND 7.5 PH, HAS MET GOALS ESTABLISHED IN 2005 WIP
- TU STUDIES INDICATE BIOLOGICAL IMPAIRMENT EXISTS, ALTHOUGH (YOY) TROUT ARE PRESENT



LEGEND

- UNTREATED
- SYSTEM IN-PLACE
- FUNDED/IN PROGRESS
- STREAMS
- ▲ FIELD TESTS ONLY
- ★ LAB SAMPLES, BOTH SAMPLE RUNS
- LAB SAMPLES DURING THE LOW FLOW RUN AND FIELD SAMPLE ONLY DURING THE HIGH FLOW RUN

SKELLY and LOY Inc. CORPORATE/ENVIRONMENTAL COMPLIANCE	03/04/20	FIGURE 1
AMD TREATMENT SYSTEMS LOCATION MAP		
SIX MILE RUN		
BROAD TOP TOWNSHIP BEDFORD COUNTY, PA		
MKT-MUNI	SCALE: 1" = 2,000'	

SIX MILE RUN, LOW FLOW, AUGUST 2017

AMD Site	pH in	pH out	Fe in	Fe out	Al in	Al out	Acidity in	Acidity out
SX2-D1	3.80	No Flow	<0.04	No Flow	8.9	No Flow	80.0	ND
SX2-D5		6.7		<0.04		<0.1		-76.6
SXO-D2	4.07	6.56	0.1	<0.04	2.5	<0.1	26.1	-30.6
SXO-D16	3.25	6.96	0.5	<0.04	6.2	<0.1	59.8	-35.5
SXO-D4	2.48	6.87	22.7	<0.04	8.0	<0.1	137.2	-71.0
SXO-D6	3.39	6.93	31.0	0.2	30.0	<0.1	330.1	-19.5
SXO-D8	3.04	7.30	7.8	<0.04	6.2	<0.1	88.4	-42.9
SX8-D1	3.39	6.93	10.8	<0.04	0.75	<0.1	68.7	-96.0
SXO-D9	4.07	6.94	29.7	0.2	8.0	<0.1	131.4	-32.8



COLO

ALEC

frog toggs

DO NOT DRINK!
DO NOT HANDLE!
DO NOT TASTE!
DO NOT SWALLOW!
DO NOT INHALE!
DO NOT USE!
DO NOT REUSE!
DO NOT RECYCLE!
DO NOT BURN!
DO NOT DISPOSE!
DO NOT LITTER!
DO NOT TRASH!
DO NOT POLLUTE!
DO NOT HARM!
DO NOT DESTROY!
DO NOT WASTE!
DO NOT ABUSE!
DO NOT MISUSE!
DO NOT OVERUSE!
DO NOT UNDERUSE!
DO NOT MISHANDLE!
DO NOT MISTREAT!
DO NOT MISTAKE!
DO NOT MISTIFY!
DO NOT MISTIFY!



8THS
length in centimeters, omit the final zero after the
ne. To read length in millimeters, include the final zero.
1000 millimeters (mm) = 1 meter (m)
1000 meters (m) = 1 kilometer (km)
100 centimeters (cm) = 1 meter (m)
1000 millimeters (mm) = 1 meter (m)
1000 meters (m) = 1 kilometer (km)
inches
feet x

CONCLUSIONS

- CITIZEN SURVEY
- DEDICATED PEOPLE
- MAINTENANCE, MAINTENANCE, MAINTENANCE.....



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