

DRBC Storage Study Update

Water Management Advisory Committee: October 13, 2022



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Manager, Water Resource
Planning Section

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Prompton Reservoir: Photo courtesy of U.S. Army Corps of Engineers

DRBC Storage Study Update

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Previous Project Updates

DRBC Commissioners

- * RFQ – June 2019
- * RFP – March 2020
- * General – September 2021
- * Brief update – December 2021
- * Screening update – March 2022
- * Draft report – September 2022

Water Management Advisory Committee

- * February 17, 2022 (presentation of high-level screening results)
- * June 16, 2022 (brief update – no details on projects)

ODRM Principals

- * January 6, 2022 (presentation of high-level screening results)

RFAC

- * December 15, 2021 (presentation of high-level screening results)

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- * Mott MacDonald contract executed on April 9, 2021 (\$649,000, ends June 30, 2022)
- * In early June 2022 – DRBC & MM extended the contract to December 31, 2022
- * DRBC webpage for the project:
<https://www.nj.gov/drbc/programs/flow/reservoir-storage-study.html>
- * Initial Screening Workshop – July 21, 2021
- * Second Screening Workshop – November 18, 2021
- * First draft of final report transmitted to DRBC – August 15, 2022

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Goal: to explore the feasibility of additional freshwater storage to meet future water availability, climate adaptation, drought management and flow management needs in the Delaware River Basin.

Objectives: Identify, inventory and evaluate the feasibility of options that could provide the following additional usable storage:






- * A minimum of 1 billion gallons (BG),
- * A minimum of 5 BG,
- * A minimum of 10 BG
- * A minimum of 20 BG

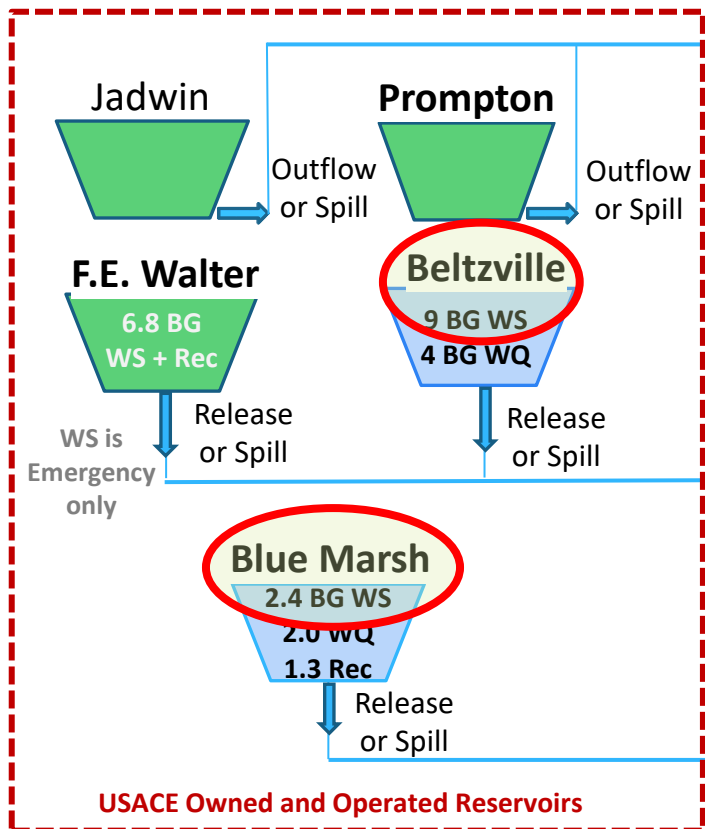
(The storage volumes can be met by a combination of projects/sources.)



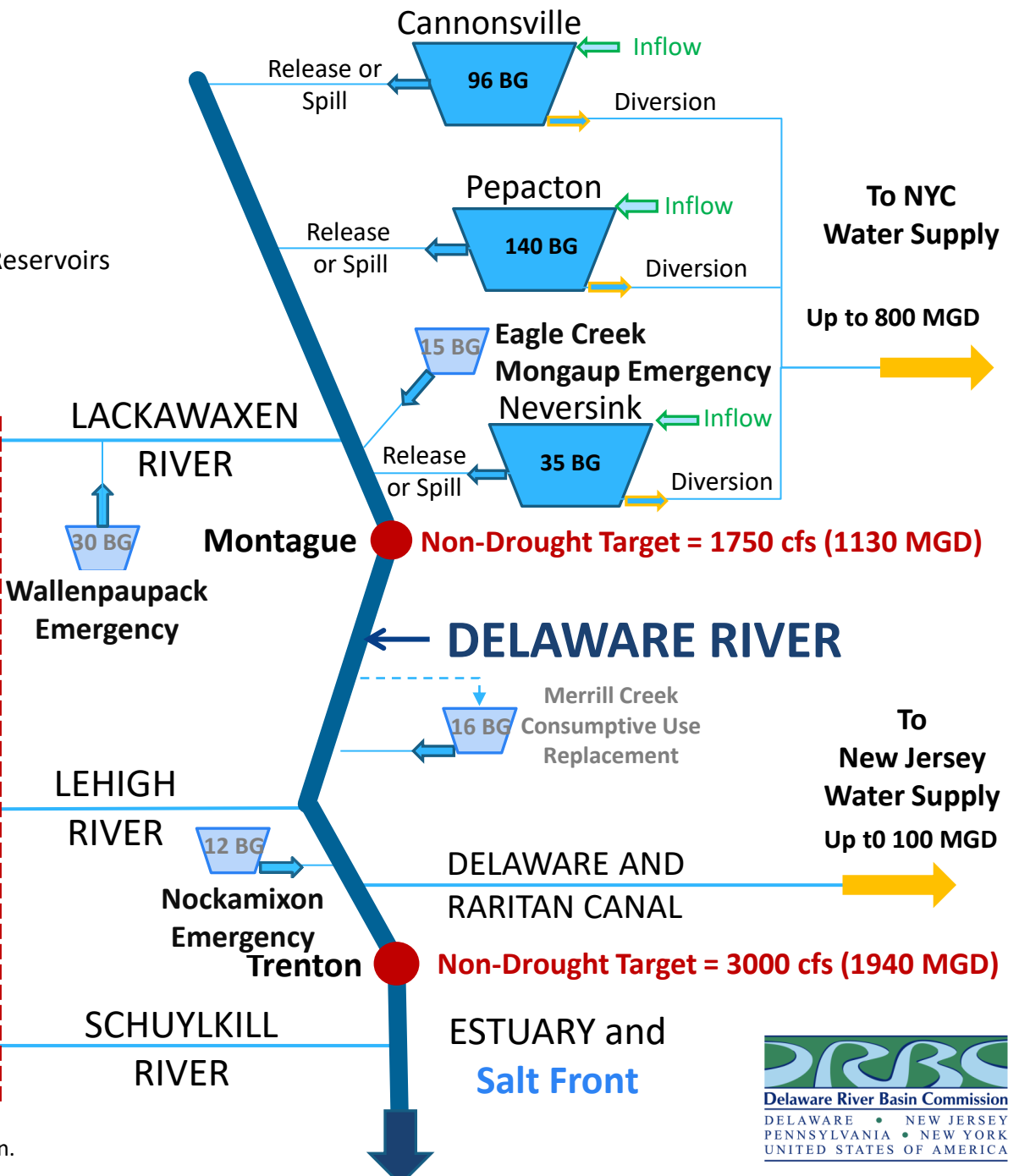
The DRBC has not made a determination of the need for additional storage within the basin. The study is a planning level inventory of potential options that would be available if the DRBC determines that additional storage is needed in the future.

Water Management Schematic for the Delaware River Basin

-  Out-of-Basin Diversion
-  Primarily Water Supply Reservoirs
-  Multi-Purpose (Flood/Power/WS/Recreation) Reservoirs
-  Primarily Flood Control Reservoir
-  Flow Management Objective



DRBC Owned Water Supply Storage
11.4 BG



Note: Not all reservoirs, tributaries, and diversions are shown.

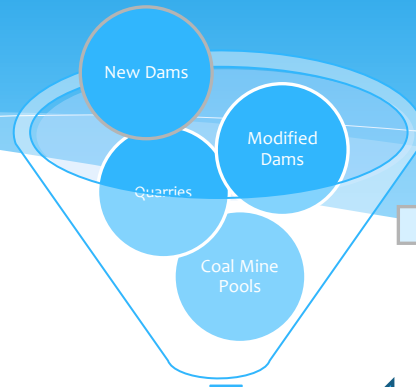


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Supplemental Screening

**GATE 1A:
MANDATORY CRITERIA
Culling by Size
Screening with Limited Data**

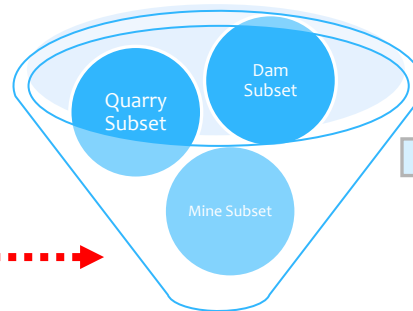


Site not Viable

OPTIONS DISCARDED
BASED ON CULLING AND
TECHNICAL ISSUES

**GATE 1B:
SUPPLEMENTARY CRITERIA
SEMI-QUANTITATIVE
ASSESSMENT**

- Storage Opportunity Research
- Specific storage details
 - Owner/Operator Interface
 - Further details from cross referenced databases
 - Early concept development



Site not Viable

Additional Staff Input on
Workshop #1 Details (Additional
Screening)

OPTIONS DISCARDED
BASED ON SEMI-
QUANTITATIVE SCREEN
AND TECHNICAL ISSUES

Additional Staff Input

REDUCED DATASET FOR
DETAILED EVALUATION

~ 40 projects

CONCEPT STORAGE
OPPORTUNITIES

PRIORITIZED PROJECTS

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1. New dams

- 21 Previously Studied Dams + Various Team identified
- 5 high potential new dams
- 2 “New” identified sites

2. Modification to existing dams:

- 24 Candidate Sites
- 16 high potential sites

3. Quarries:

- 1,300 Quarries in 3 states
- 33 potential sites

4. Deep Mines:

- 31 Mine Pools in DRB
- 5 high potential sites

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New Dams

PREVIOUSLY IDENTIFIED SITES FOR NEW DAMS

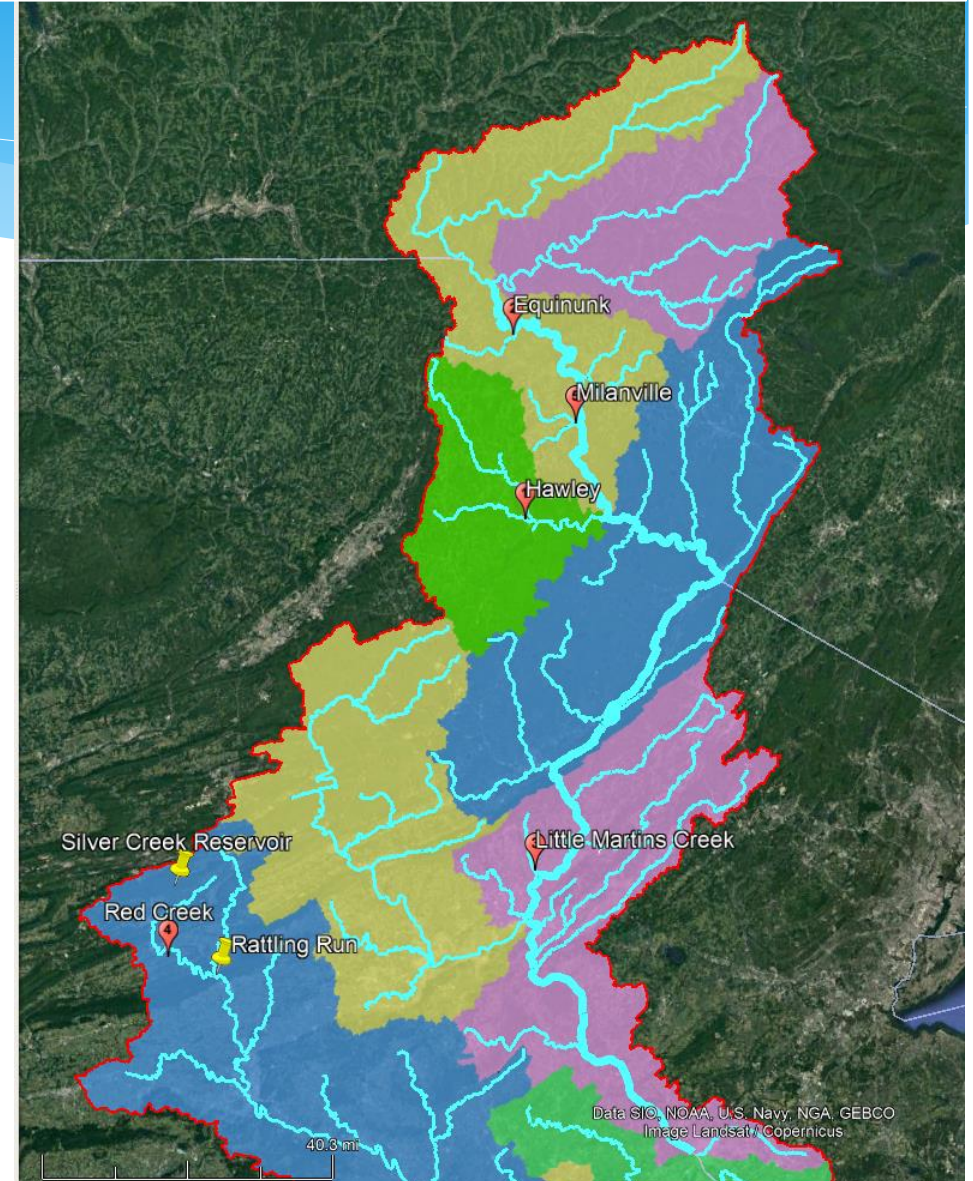
Map key	Project Name	County	Subwatershed	New Capacity, BG	Flooded Area, ac
1	Hawley	Wayne	Lackawaxen	?	394
2a	Equinunk (small)	Wayne	Upper DR	10	485
2b	Equinunk (large)	Wayne	Upper DR	43	1358
3	Little Martins Creek	Northampton	Middle DR	29	1122
4	Red Creek	Schuylkill	Schuylkill	26	1282
5	Milanville	Wayne	Lackawaxen	43	1979

NEW SITES FOR NEW DAMS

- 6 - Silver Creek
- 7 - Rattling Run



Carried 7 concepts forward.



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Existing Dams

Existing Dams are being evaluated for both “Dam Raising” and “Purchase/Lease” of existing storage.

NAME	STATE	COUNTY	CURRENT MAX STORAGE, BG	OWNER	OWNER TYPE
MERRILL CREEK	NJ	WARREN	15	MERRILL CRK GROUP	POWER COS
MONGAUP SYSTEM	NY	SULLIVAN	5	EAGLE CREEK	POWER CO
CANNONSVILLE	NY	DELAWARE	141	NYCDEP	PUBLIC WATER
PENN FOREST	PA	CARBON	9	BETHLEHEM	PUBLIC WATER
WILD CREEK	PA	CARBON	6	BETHLEHEM	PUBLIC WATER
LAKE ONTELAUNEE	PA	BERKS	7	READING	PUBLIC WATER
STILL CREEK	PA	SCHUYLKILL	4	TAMAQUA WATER	PUBLIC WATER
GREEN LANE RES	PA	MONTGOMERY	8	AQUA PA	PRIVATE WATER
PROMPTON	PA	WAYNE	24	USACE	FEDERAL
BLUE MARSH	PA	BERKS	42	USACE	FEDERAL

Carried ~10 concepts forward.

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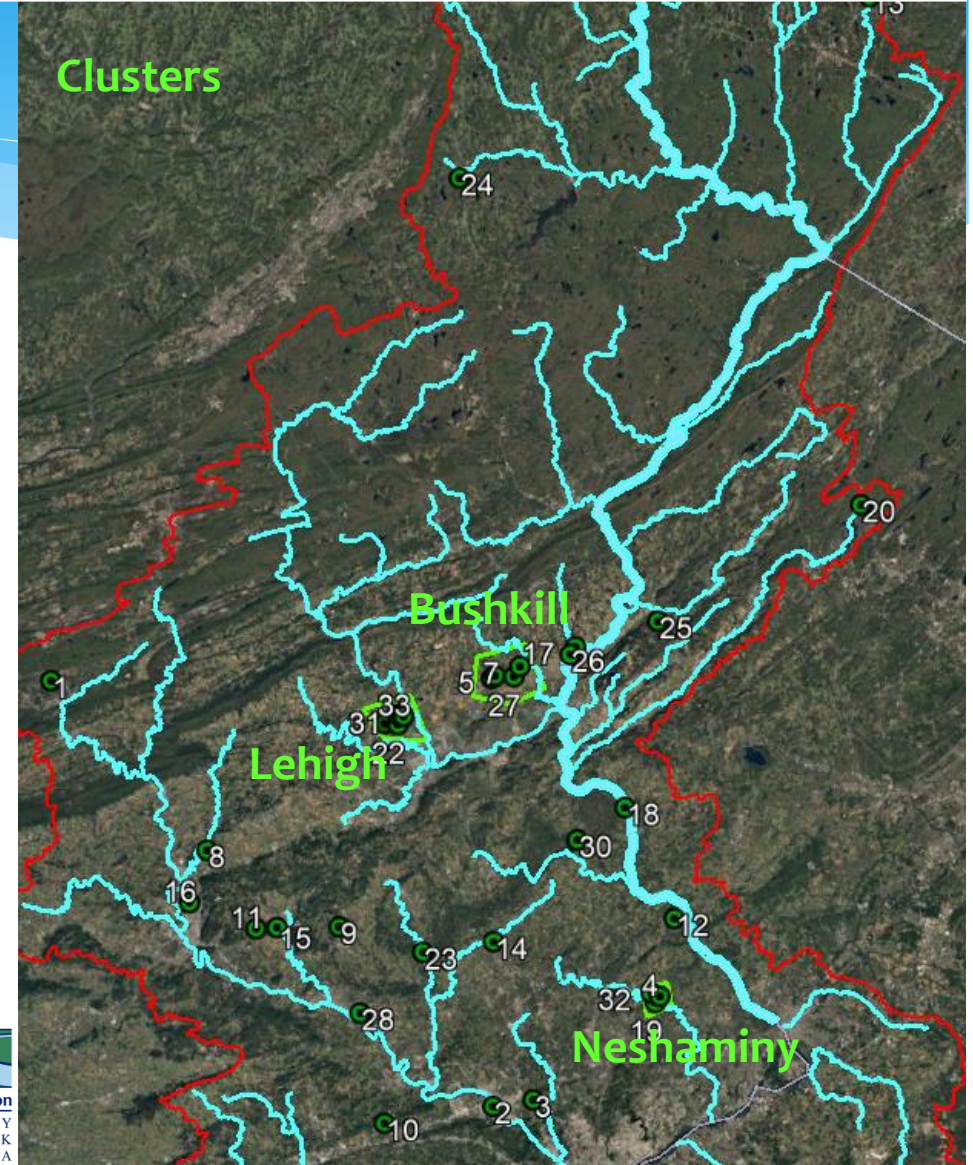
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Quarries

Started with >1,300 sites

Screened down to ~ 33 based largely on volume
three “clusters” have emerged

Carried ~19 concepts forward.



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Mines

Reviewed existing information from PADEP, USBM, EPCAMR, Schuylkill Headwaters Association, SRBC

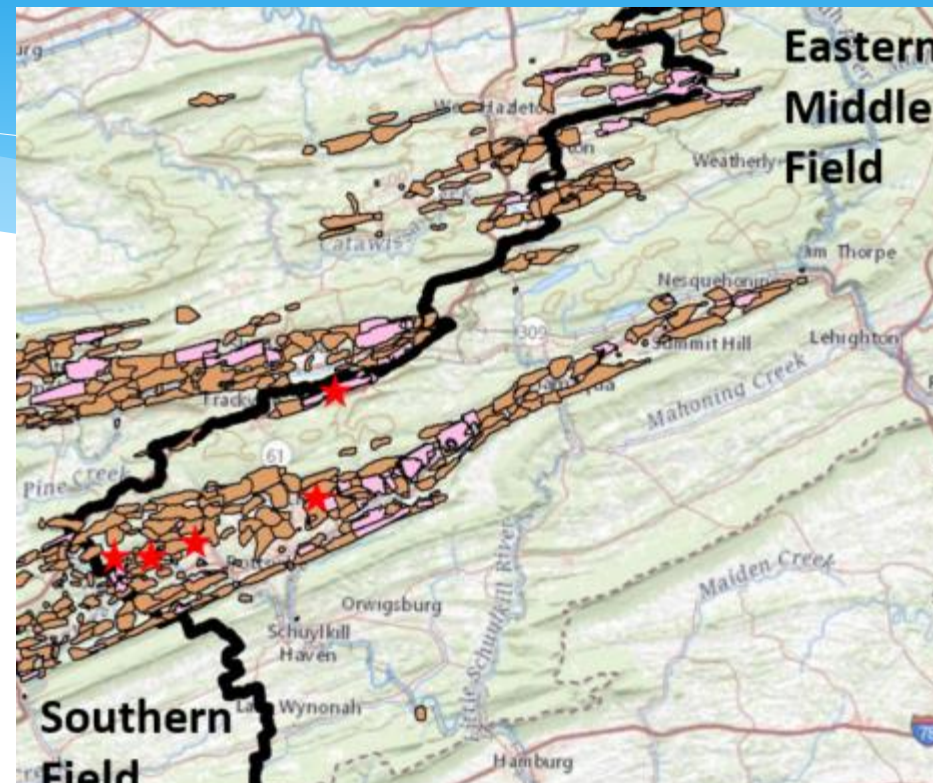
Begin to develop project concepts.

Carried 5 concepts forward.

South Anthracite Field			Eastern Middle Anthracite Field			
Key	Pool	Vol. (gal)	Key	Pool	Vol. (gal)	
1	Tamaqua Lands (S)	800,000,000	24	Audenreid	241,844,000	
2	Tamaqua Lands (N)	312,000,000	25	Spring Brook	5,880,000	
3	Mary D	400,000,000	26	Tresckow	17,280,000	
4	Kaska	600,000,000	27	Tresckow #21	84,240,000	
5	Silver Creek	1,774,000,000	X	29	Coleraine	67,860,000
6	Eagle Hill	727,000,000	29	Evans	20,160,000	
7	Palmer Vein	400,000,000	31	Silver Brook	683,000,000	
8	Bear Ridge	40,000,000		Total	1,120,264,000	
9	Pine Fores	419,000,000				
10	Wadesville	3,582,000,000	X			
11	Pottsville East	125,000,000				
12	Pine Knot #1	600,000,000				
13	Thomaston	784,000,000				
14	Richardson	625,000,000				
15	Glendower	403,000,000				
16	Buck Run (old)	477,000,000				
17	Buck Run (dam basin)	53,000,000				
18	Lytle	795,000,000				
19	Phoenix Park	2,054,000,000	X			
20	Otto	2,265,000,000	X			
21	Middle Creek	700,000,000				
	Total	17,935,000,000				

Western Middle Anthracite Field		
Key	Pool	Vol. (gal)
#	Morea	2,679,000,000
NA	Total	2,679,000,000#

Note: Volumes taken from USBM TP #727-1949; # denotes value from USGS SIR 2010-5261.



Name	Region	Estimated Volume (BG)
Silver Creek	South Anthracite Field	1.8
Wadesville	South Anthracite Field	3.6
Phoenix Park	South Anthracite Field	2.1
Otto	South Anthracite Field	2.3
Morea	Western Middle Anthracite Field	2.7
	Total	12.5

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What does “carried forward” mean?

The 38 projects which made it to the final round of screening are then further developed conceptually. The project concept is captured in a multi-page Storage Project Summary (SPS).

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38 Storage Project Summaries (SPS)

1. Project Overview
2. Water Quantity & Quality
3. Infrastructure Design, Construction & Operation
4. Environmental Impacts
5. Social & Economic Impacts
6. Project Cost & Schedule
7. Potential Ancillary Benefits
8. Storage Project Score

This enables comparisons of projects.

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Table 7-1 All projects sorted by weighted score

ID	Project Name	Location	Project type	Vol. (BG)	Total Cost (M\$)	Cost effective-ness (M\$/BG)	Pump in or Gravity	OVERALL WEIGHTED SCORE	1. Water quantity & quality	2. Infra. design, const. & Ops.	3. Environ. impacts	4. Social & Economic Impacts	5. Project Costs & Schedule	6. Ancil. Benefits
T2	Rio	Sullivan, NY	Transfer	2.0	27	14	NA	4.16	4.17	4.60	5.00	5.00	3.83	1.00
Q19	Eureka Rush Valley	Bucks	Quarry	1.7	24	14		4.07	3.75	3.60	4.79	4.88	4.00	3.60
Q02	Dyer Glasgow	Montgomery	Quarry	6.2	30	5		4.06	3.50	3.10	4.61	4.75	4.50	3.60
E4	Prompton	Wayne	Dam mod	2.0	2	1	G	4.04	4.17	3.80	3.25	4.78	4.50	1.80
Q04	Hanson Penns Peak	Bucks	Quarry	3.3	31	10		4.04	3.58	3.60	4.57	4.88	4.17	3.60
Q12	Solebury	Bucks	Quarry	2.3	38	16		4.03	3.75	3.20	4.57	5.00	4.00	4.00
Q25	Tilcon Oxford	Warren, NJ	Quarry	1.2	28	23		4.02	4.00	3.60	4.57	4.88	3.83	2.80
T4	Lake Ontelaunee	Berks	Transfer	1.0	27	27	NA	4.01	3.33	4.60	5.00	5.00	4.17	1.00
Q07	Glasgow (Delaware)	Northampton	Quarry	4.6	26	6		4.01	4.08	3.70	4.93	4.25	3.67	3.00
E2	Cannonsville	Delaware, NY	Dam mod	13.0	77	6	G	3.99	4.67	3.60	3.21	4.89	4.00	1.20
Q22	NESL Whitehall	Lehigh	Quarry	1.2	34	28		3.96	3.83	3.00	4.86	4.69	3.67	4.20
Q21	NESL Osmrod	Lehigh	Quarry	1.3	45	35		3.92	3.83	3.10	4.93	4.63	3.50	4.20
T1	Merrill Creek	Warren, NJ	Transfer	2.0	110	55	NA	3.91	4.50	4.60	5.00	5.00	2.67	1.00
Q23	Lehigh Perkiomenville	Montgomery	Quarry	1.0	26	26		3.91	3.58	3.80	4.79	4.88	3.67	3.00
Q01	Pottsville	Schuykill	Quarry	6.9	39	5		3.91	3.42	3.40	4.21	4.63	4.17	4.00
Q08	Holcim Evansville	Berks	Quarry	3.1	44	14		3.91	3.75	3.20	4.79	4.00	3.83	3.90
T3	Penn Forest/Wild Creek	Carbon/ Monroe	Transfer	3.0	162	54	NA	3.87	3.83	4.60	5.00	5.00	3.17	1.20
Q27	NESL Nazareth	Northampton	Quarry	1.0	25	25		3.86	3.67	3.40	4.21	5.00	3.83	2.80
Q03	Plymouth Meeting	Montgomery	Quarry	3.5	39	11		3.76	3.50	3.10	3.89	4.75	3.83	3.80
M32	Morea Basin	Schuykill	Mine Pool	2.7	65	24	P	3.58	3.08	3.20	4.43	5.00	3.50	2.40
M20	Otto	Schuykill	Mine Pool	2.3	65	28	P	3.53	3.17	3.00	4.43	5.00	3.33	2.40
Q14	M&M Telford	Bucks	Quarry	1.0	25	25		3.50	3.17	2.90	4.07	4.75	3.67	1.40
Q07	Glasgow (Bushkill)	Northampton	Quarry	4.6	26	6		3.47	3.42	2.50	3.43	4.50	3.67	2.60
Q16	Berks Temple	Berks	Quarry	1.0	30	30		3.42	3.25	2.20	4.64	3.25	3.67	2.00
Q05	Glasgow Nazareth	Northampton	Quarry	4.2	48	12		3.37	3.25	2.30	3.00	4.38	3.83	2.60
Q06	Lehigh Imperial	Northampton	Quarry	3.8	51	13		3.34	3.25	2.30	3.14	4.38	3.67	2.60
E1	Wild Creek	Carbon/ Monroe	Dam mod	1.0	135	135	G	3.29	4.00	2.80	3.50	4.89	2.50	1.00
E3	Blue Marsh	Berks	Dam mod	5.0	65	13	G	3.19	3.83	2.20	3.43	4.11	2.67	1.80
M5	Silver Creek	Schuykill	Mine Pool	1.7	65	38	P	3.12	3.00	3.20	4.50	5.00	2.00	2.40
N4	Rattling Run	Berks	New dam	1.3	293	225	G	3.05	3.83	3.40	3.36	4.22	1.83	1.60
N5	Equimunk	Wayne	New dam	42.0	1150	27	G	3.03	4.50	2.60	2.00	3.00	2.33	2.40
M19	Phoenix Park	Schuykill	Mine Pool	2.1	65	31	P	2.99	2.83	2.90	4.21	5.00	2.00	2.40
N2	Milanville	Wayne	New dam	42.0	950	23	G	2.95	4.17	2.60	2.16	3.00	2.33	2.40
N1	Red Creek	Schuykill	New dam	13.3	366	28	P	2.90	3.67	2.20	2.93	3.22	2.33	2.40
N6	Hawley	Wayne	New dam	1.3	182	140	G	2.87	4.17	2.80	2.18	3.33	2.00	1.60
N3	Little Martins Creek	Northampton	New dam	7.1	353	50	P	2.87	4.17	2.20	1.96	3.44	2.17	2.20
N7	Silver/Big Creek	Schuykill	New dam	11.3	921	81	P	2.77	3.50	1.80	2.68	4.33	1.83	3.00
M10	Wadesville	Schuykill	Mine Pool	3.6	65	18	P	0.00	NA	NA	NA	NA	NA	NA

Top 38 Projects

- * Storage Projects Summaries (SPS) developed for each
- * 7 New Dams
- * 4 Dam Modifications
- * 4 Transfers
- * 18 Quarries
- * 5 Mine Pools
- * 2 groupings of projects

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Table 7.3-1 Most Feasible Projects, Sorted by Overall Score

Site Name	Site ID	County/ State	Overall Weighted Score	Volume, BG	Cost, M\$	Cost Effectiveness, M\$/BG
Eureka Rush Valley	Q19	Bucks, PA	4.07	1.7	24	14.1
Dyer	Q02	Montgomery, PA	4.06	6.2	30	4.9
Prompton	E4	Wayne, PA	4.04	2.0	2	1.0
Penns Peak	Q04	Bucks, PA	4.04	3.3	31	9.5
Solebury Twp	Q12	Bucks, PA	4.03	2.3	38	16.3
Tilcon Oxford	Q25	Warren, NJ	4.02	1.2	28	23.3
Glasgow (Del River)	Q07	Northampton, PA	4.01	4.6	26	5.7
Cannonsville	E2	Delaware, NY	3.99	13.0	77	5.9
Whitehall	Q22	Lehigh, PA	3.96	1.2	34	28.0
Ornrod	Q21	Lehigh, PA	3.92	1.3	45	34.6
Wadesville	Q01	Schuylkill, PA	3.91	6.9	39	4.8
Holcim Evansville	Q08	Berks, PA	3.91	3.1	44	14.3
Perkiomenville	Q23	Montgomery, PA	3.91	1.0	26	26.0
NESL Nazareth	Q27	Northampton, PA	3.86	1.0	25	25.0

Most Feasible Projects

- * Doesn't include transfers
- * Shouldn't be thought of a ranking, but rather a grouping
- * 14 projects; 12 quarries, 2 expansions at existing reservoirs
- * Most are in PA
- * No new dams
- * No mine pools
- * Quarries are constrained by fill & discharge rates (pump sizes, pipelines, etc.)

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Transferrable Storage – “excess existing storage”

- * Project team was unable to get a good sense of costs and volume available without additional detailed, serious discussions with owners.
- * However, feel confident that water is available.
- * Transfers were not included in the most feasible for this reason.
- * Captured in Appendix B of the report.

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Special Notes on Quarries

1. Most owners probably do not know anything about DRBC.
2. Most owners do not know that they are included in this study.
3. DRBC/MM has not yet contacted / interacted with most owners.
4. Information to develop project concept came from public sources.

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August 15: Draft report to DRBC

September 9: Comments back to MM

Next Steps

- * Revised draft report from MM
- * Draft report to signatory member reviewers
- * Final Report

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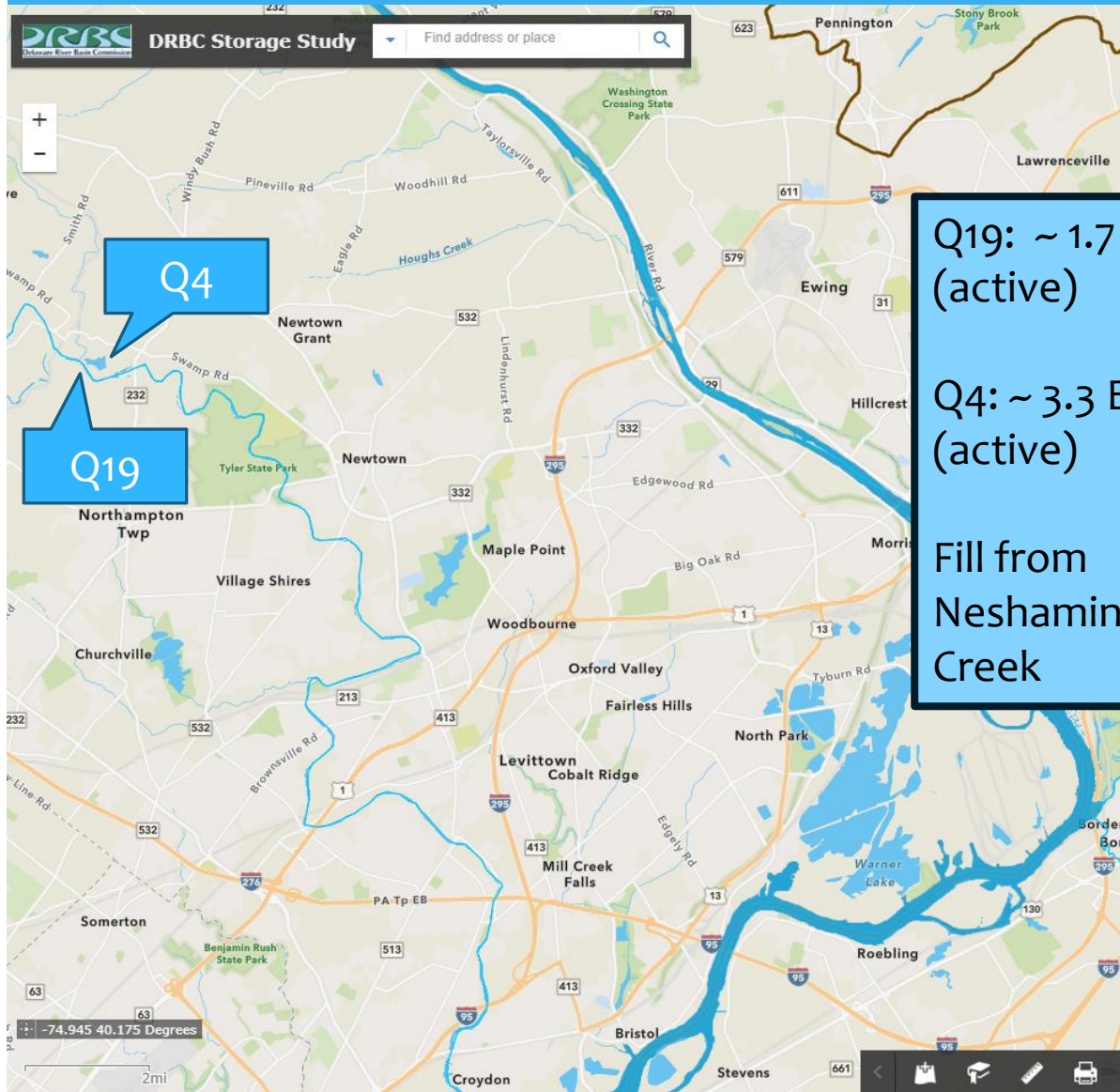
Preview of Most Feasible Projects

- * Doesn't include transfers
- * Grouping vs. ranking
- * 14 projects; 12 quarries, 2 expansions at existing reservoirs
- * Most are in PA
- * No new dams
- * No mine pools
- * Quarries are constrained by fill & discharge rates (pump sizes, pipelines, etc.)

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Q19 – Eureka Rush Valley & Q4 Penns Park



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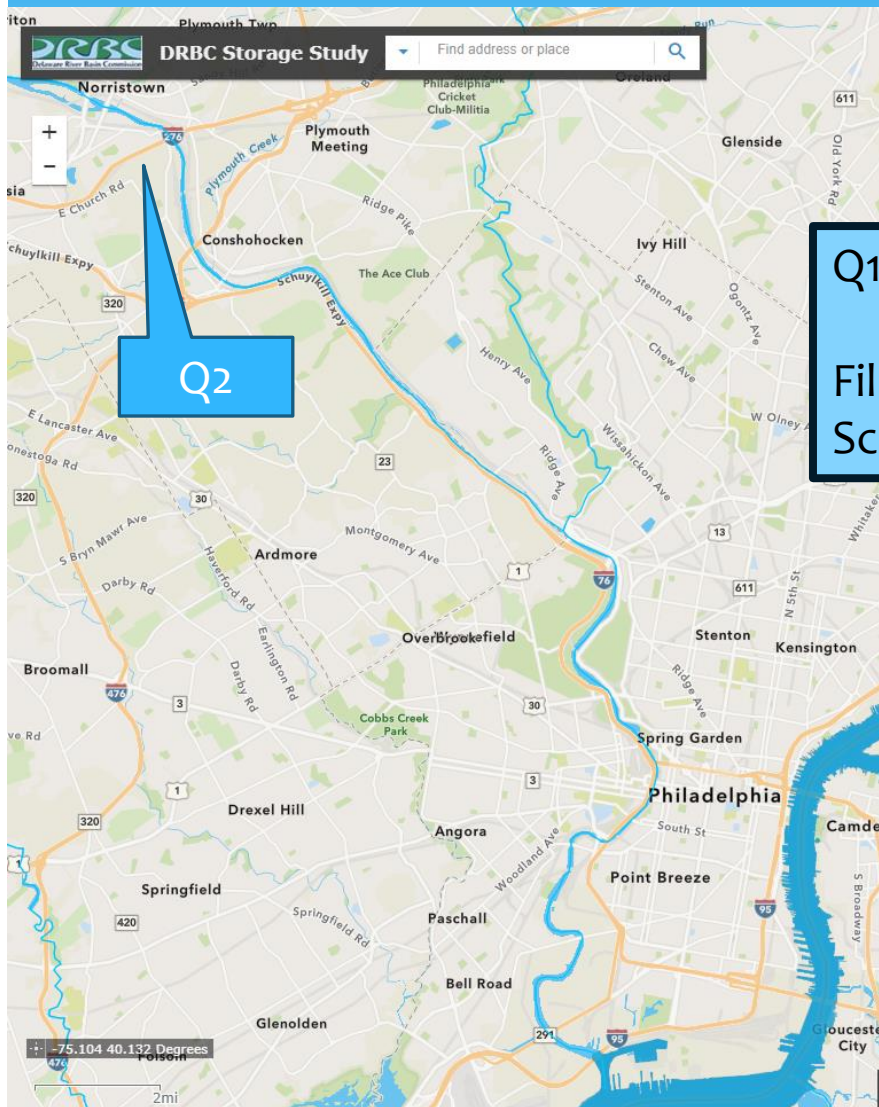


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Q2 – Dyer (aka McCoy) Quarry



Q19: ~ 6.2BG
Fill from
Schuylkill River



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Q2

Q19: ~ 6.2BG
Fill from
Schuylkill River

Q2 – Dyer (aka McCoy) Quarry

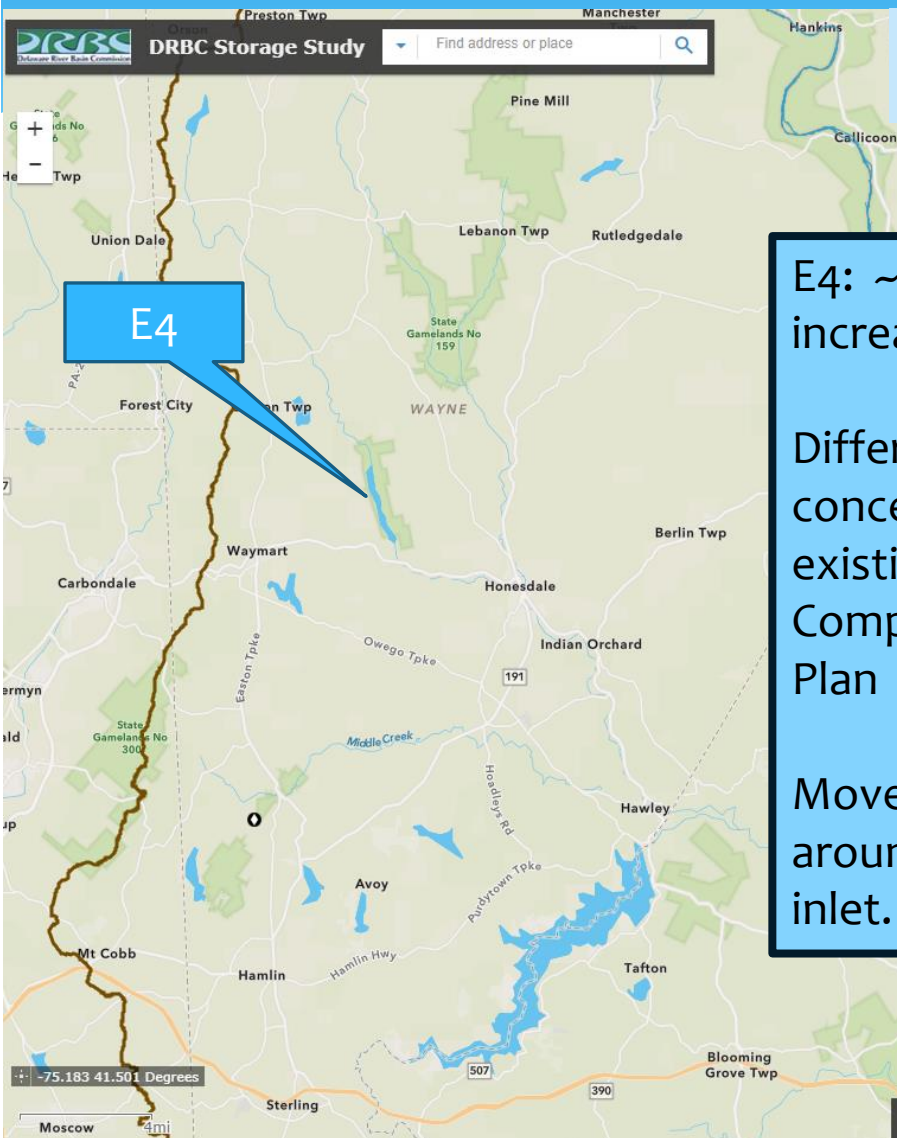
-75.332 40.098 Degrees

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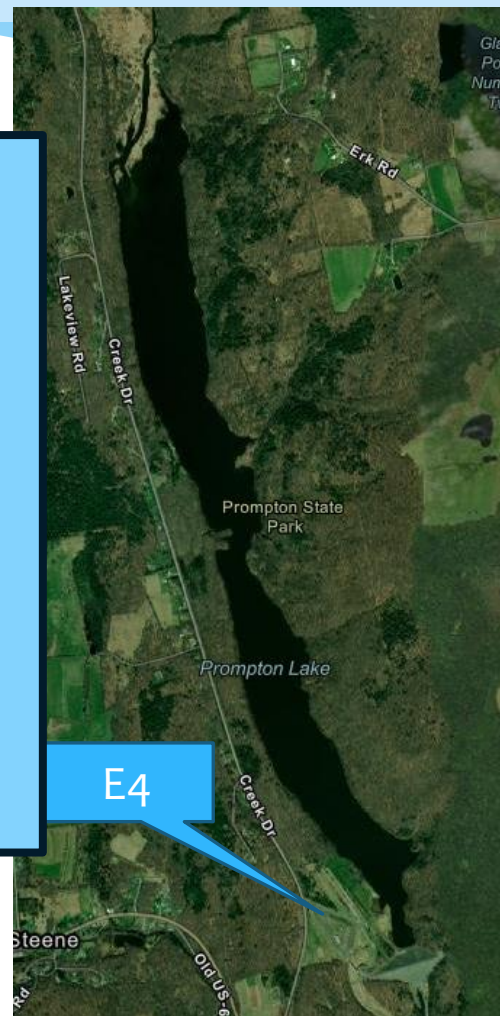
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E4 – Prompton

E4: ~ 2 BG increase
Different from concept in existing Comprehensive Plan
Moveable gates around existing inlet.

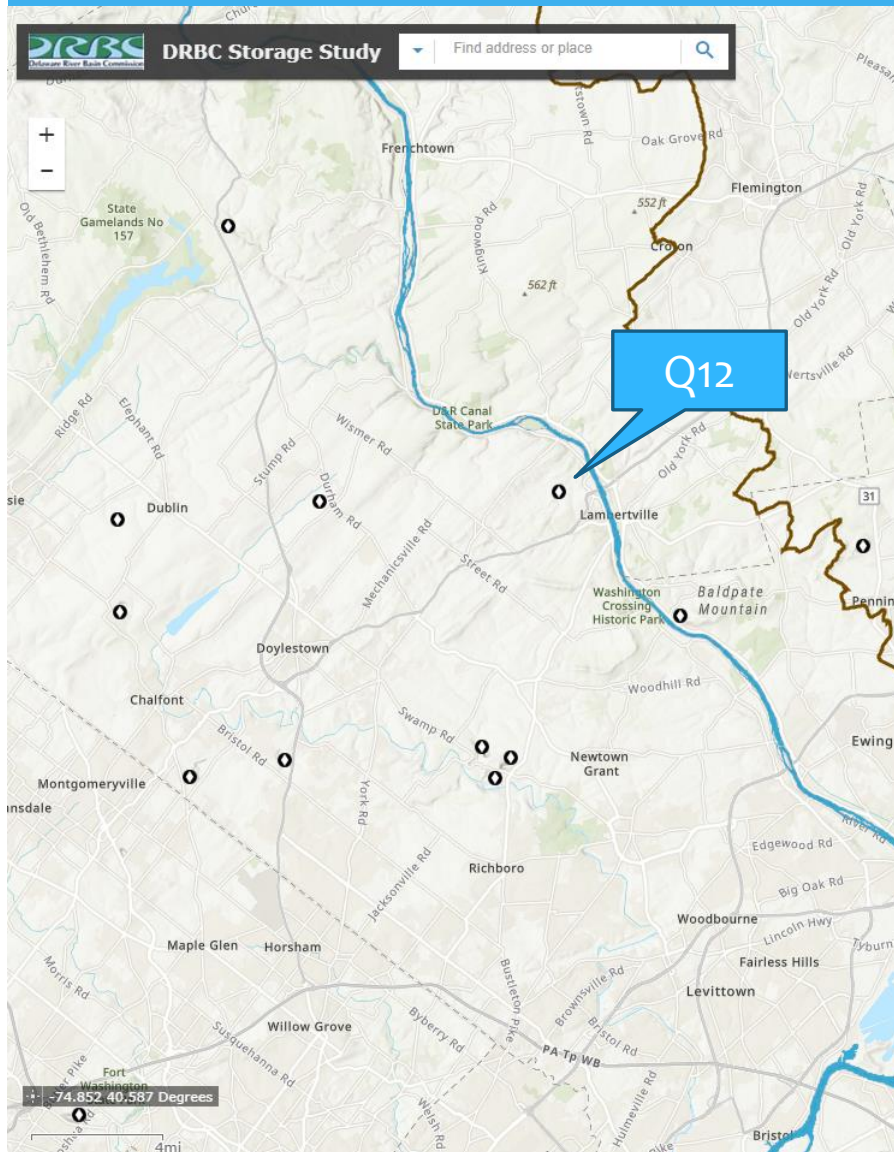


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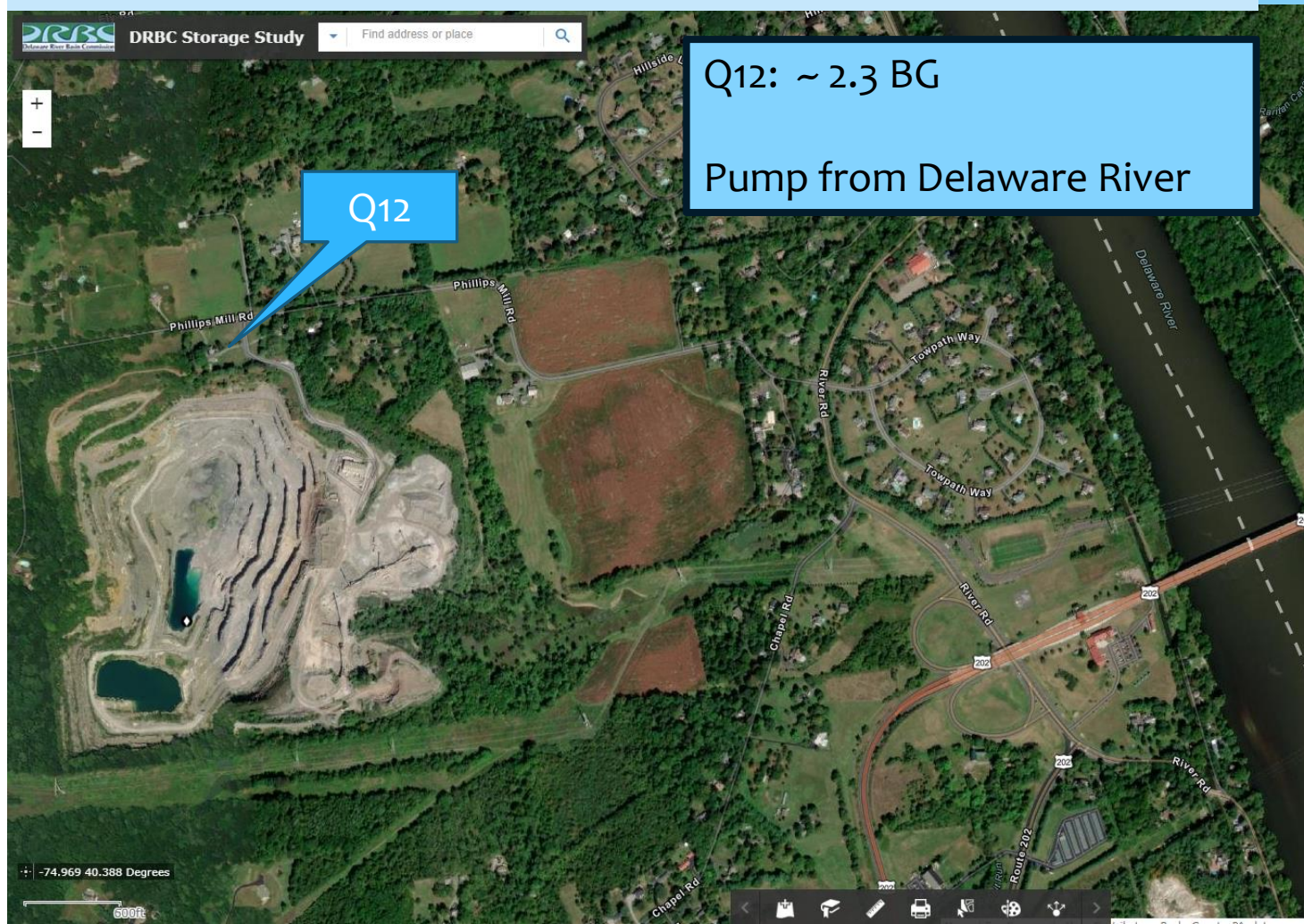


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Q12 – Solebury Quarry (inactive)



Q12: ~ 2.3 BG
Pump from Delaware River

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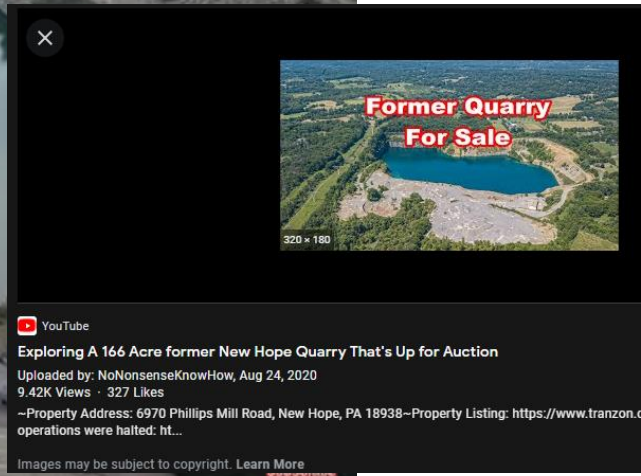
Q12 – Solebury Quarry (inactive)

Q12: ~ 2.3 BG

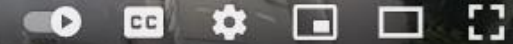
Pump from Delaware River



<https://www.youtube.com/watch?v=C04j1y8HMEc>



10:41 / 11:24



Exploring A 166 Acre former New Hope Quarry That's Up for Auction

9,433 views Aug 25, 2020 ~Property Address: 6970 Phillips Mill Road, New Hope, PA 18938

~Property Listing: <https://www.tranzon.com/al90920a> ...more

359 Dislike Share Save ...

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Q25 – Tilcon Oxford Quarry

Q25: ~ 1.2 BG (active)
Fill from Pequest River

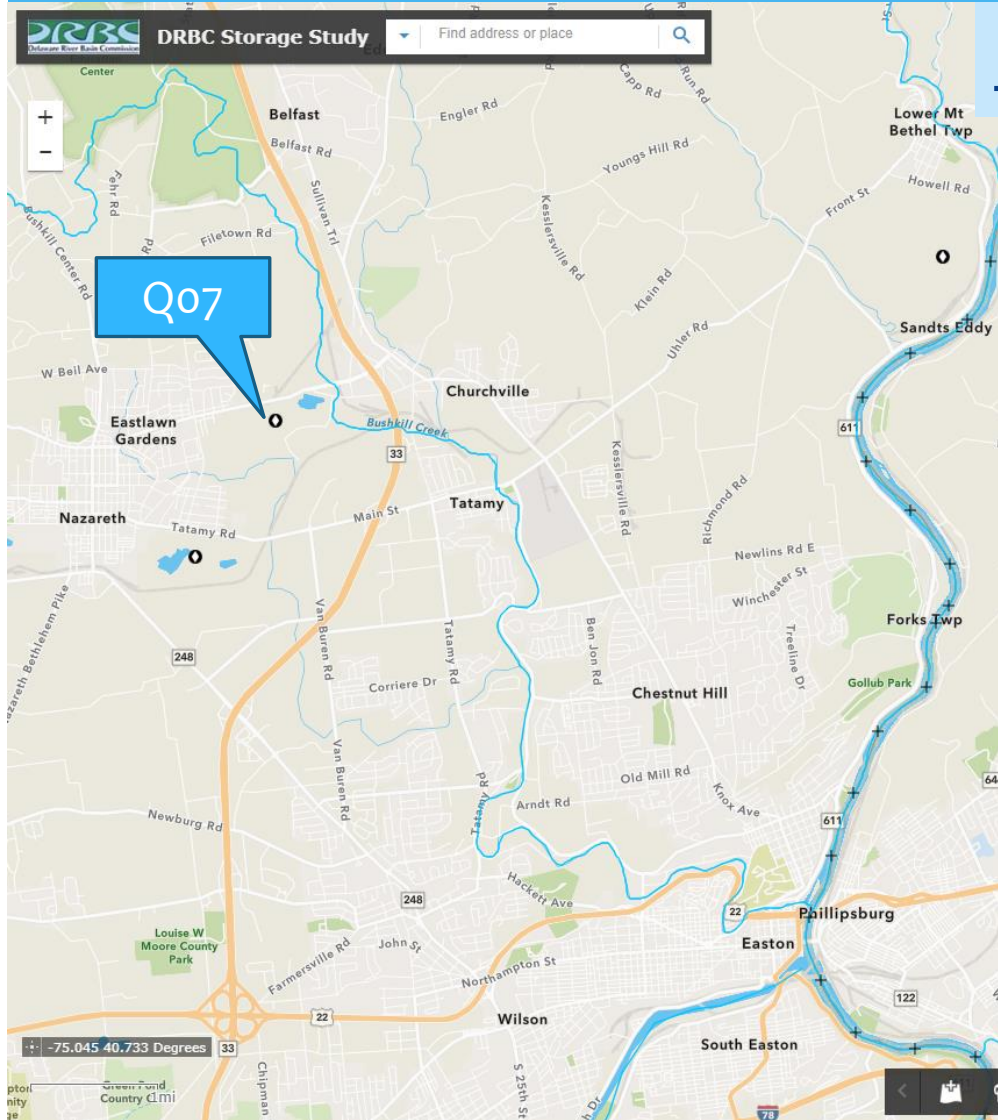


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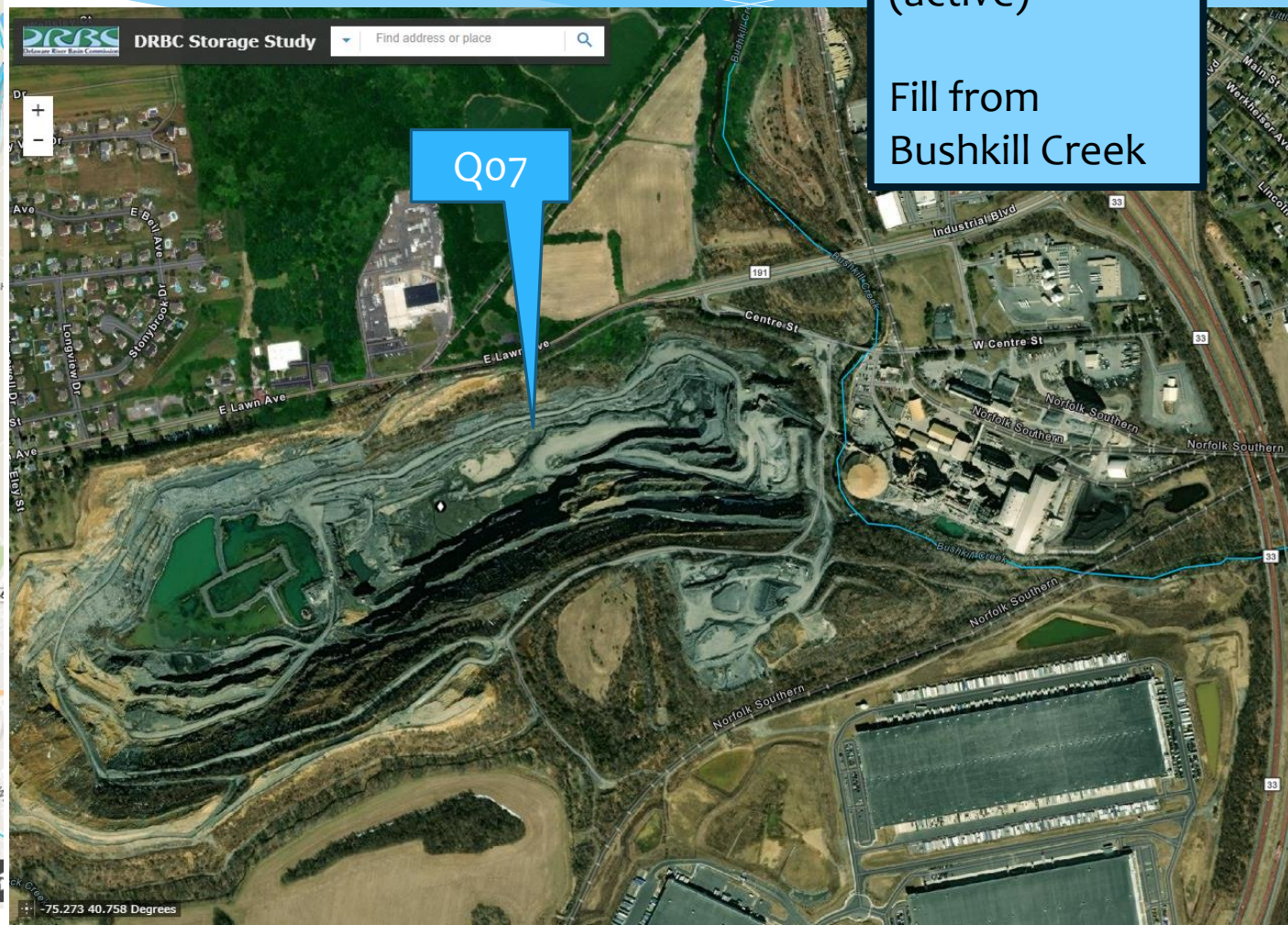


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Q07 – Glasgow Quarry



Q07: ~ 4.6 BG
(active)

Fill from
Bushkill Creek

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Q07 – Glasgow Quarry

Q07: ~ 4.6 BG
(active)

Fill from
Bushkill Creek

Overlays

LVPC 2015 Digital Ortho
for Lehigh/Northampton C
County Mosaics



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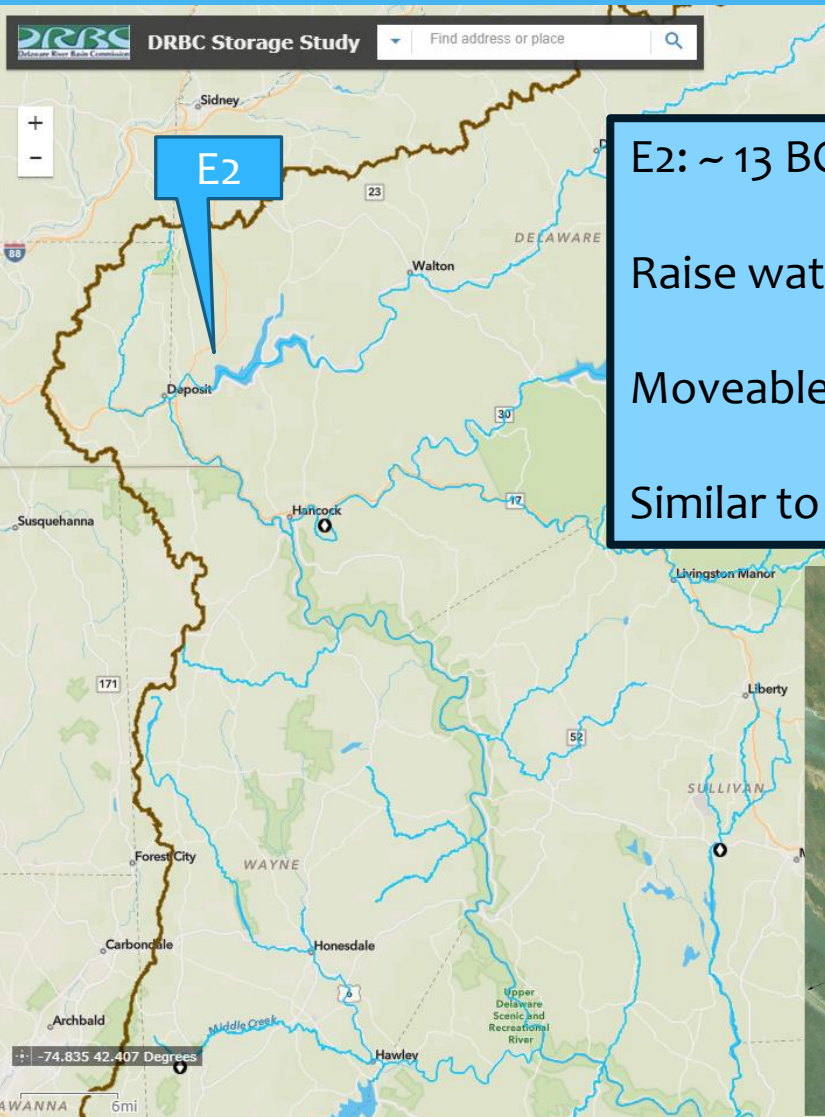


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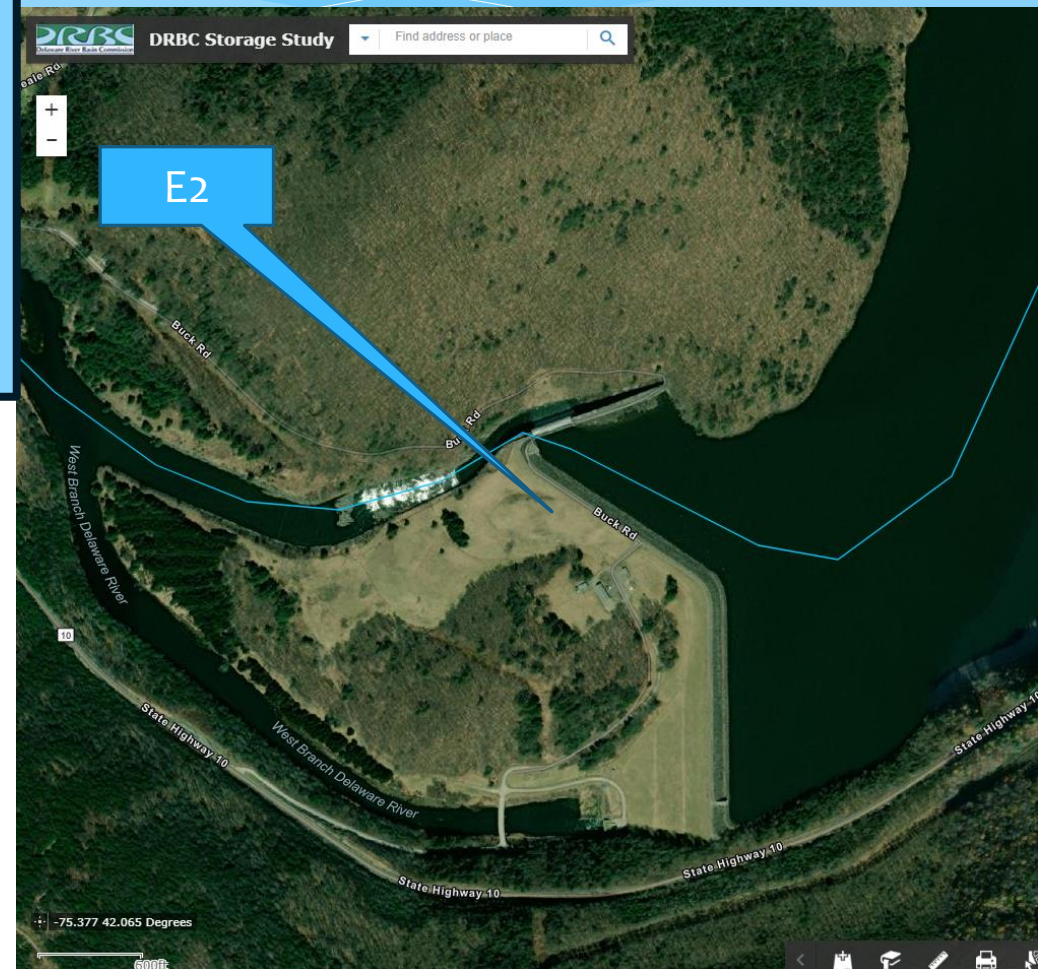
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E2 – Cannonsville Reservoir Expansion



E2: ~ 13 BG increase
Raise water level by 8 ft
Moveable gate on existing spillway
Similar to 1986 engineering study

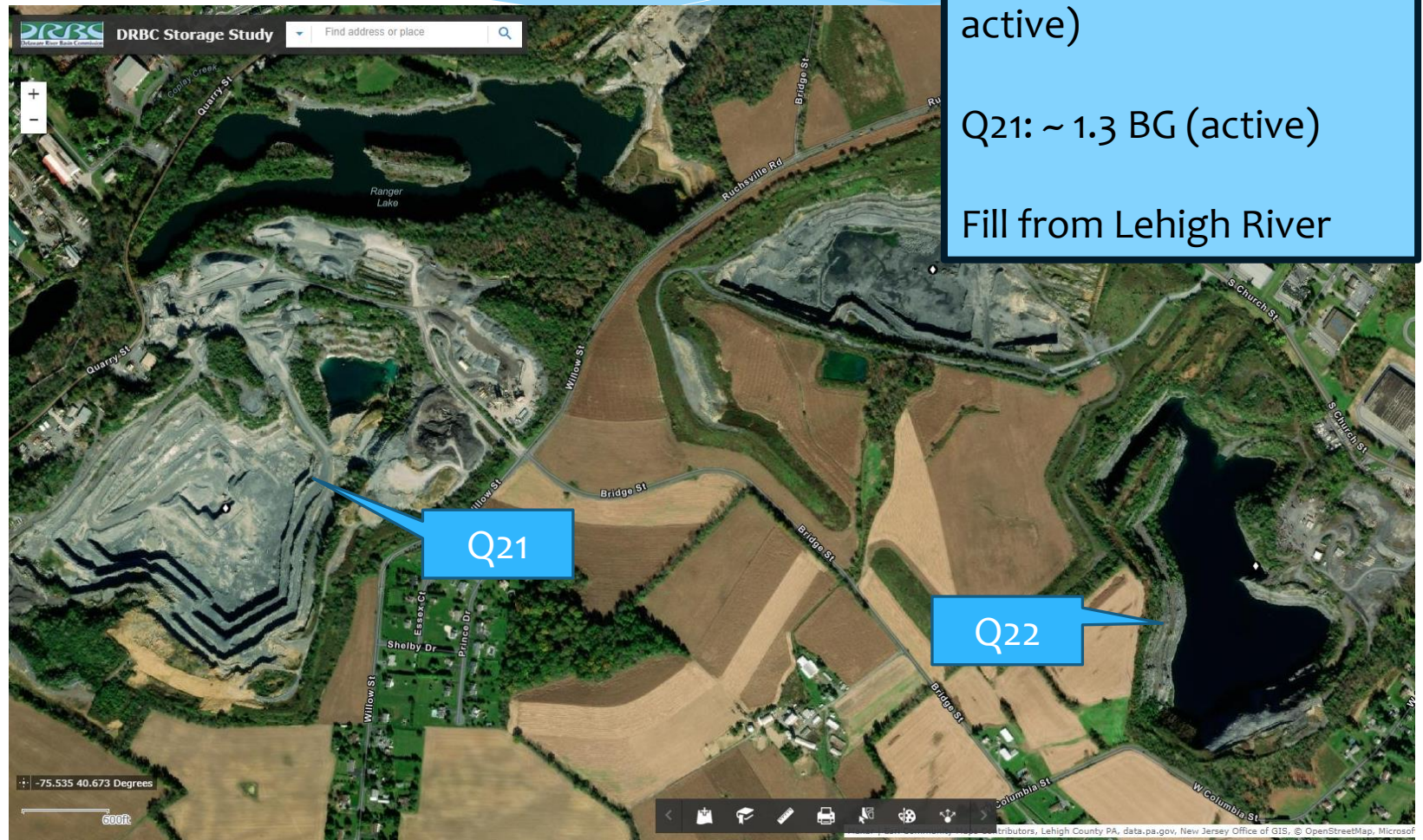
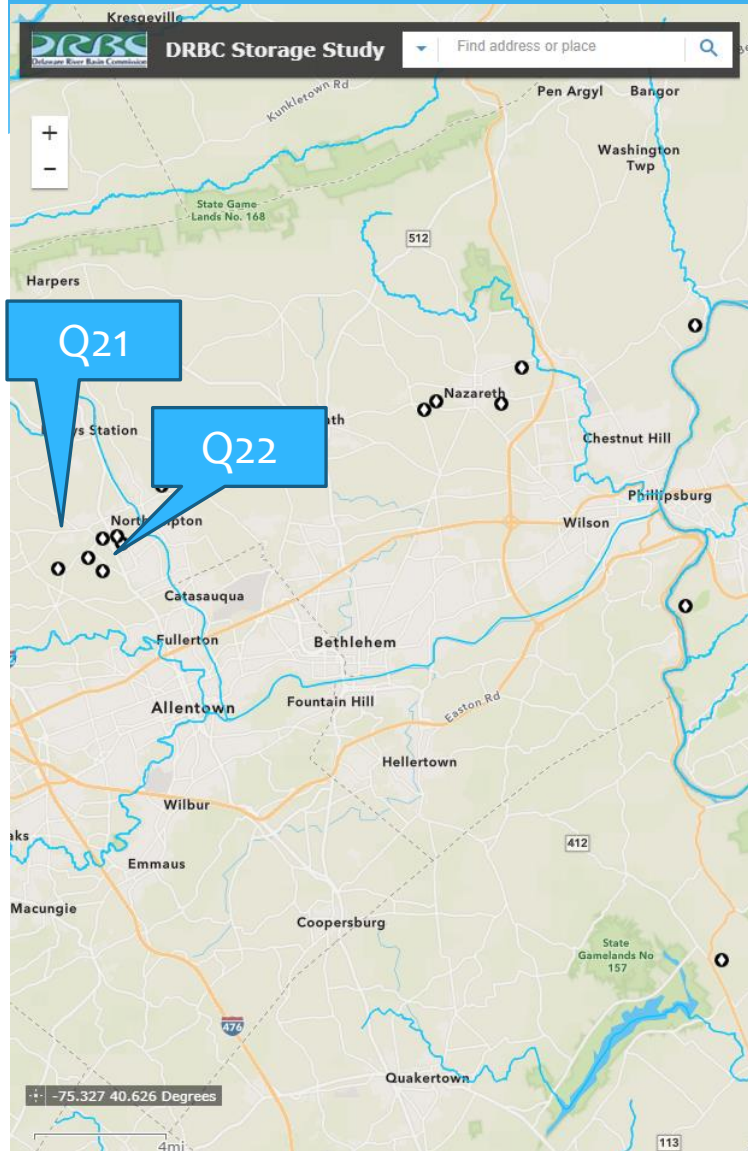


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Q22 – Whitehall & Q21 Ormrod Quarries



Q22: ~ 1.2 BG (semi active)
Q21: ~ 1.3 BG (active)
Fill from Lehigh River

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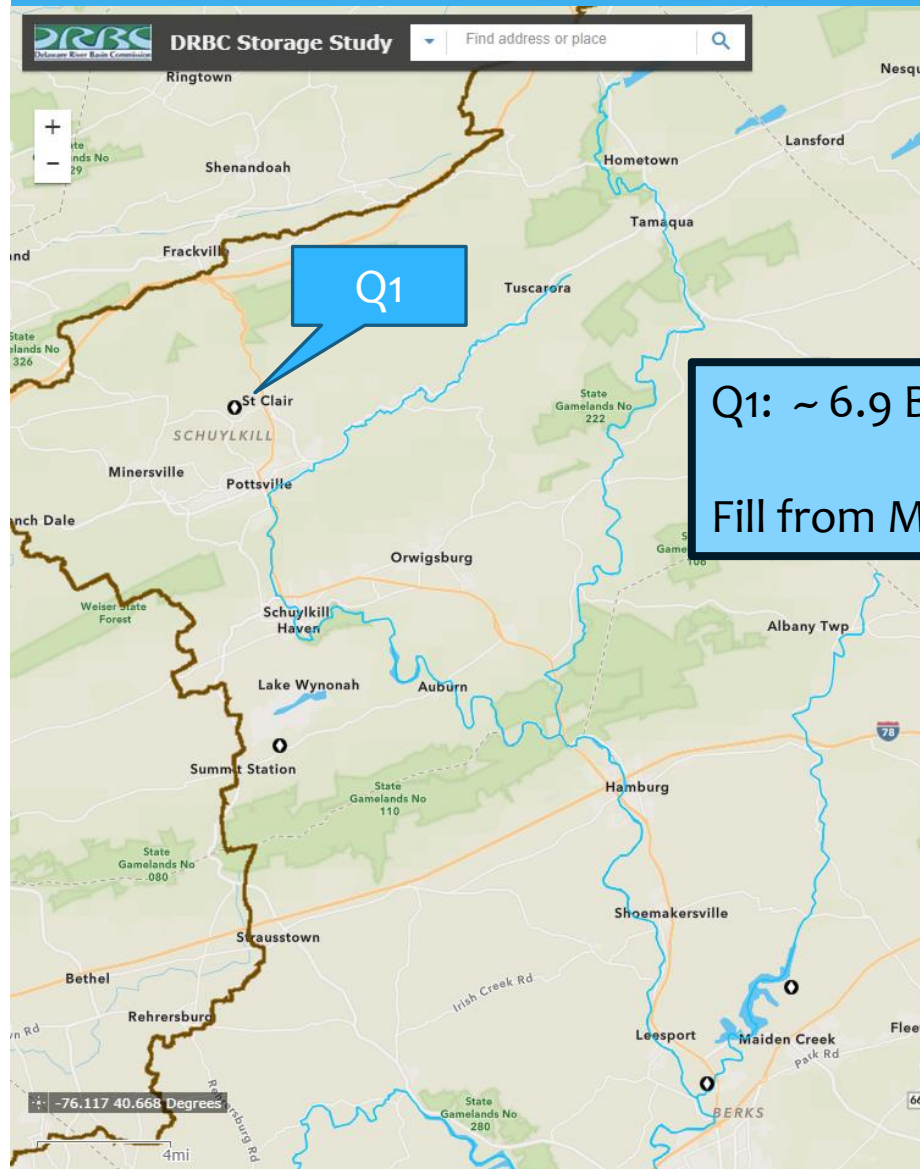


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Q1 – Wadesville Pit



Q1: ~ 6.9 BG (active)
Fill from Mill Creek



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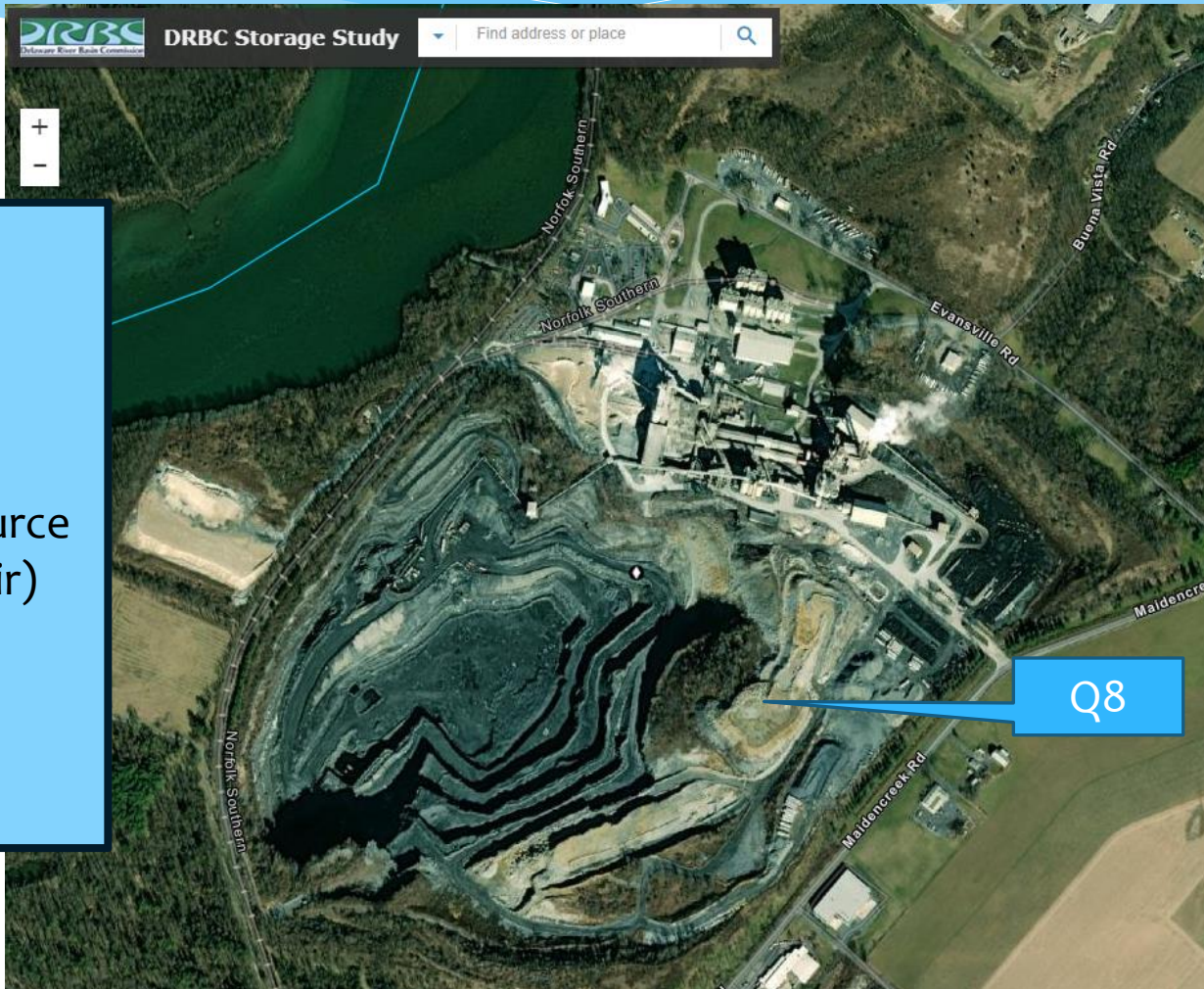
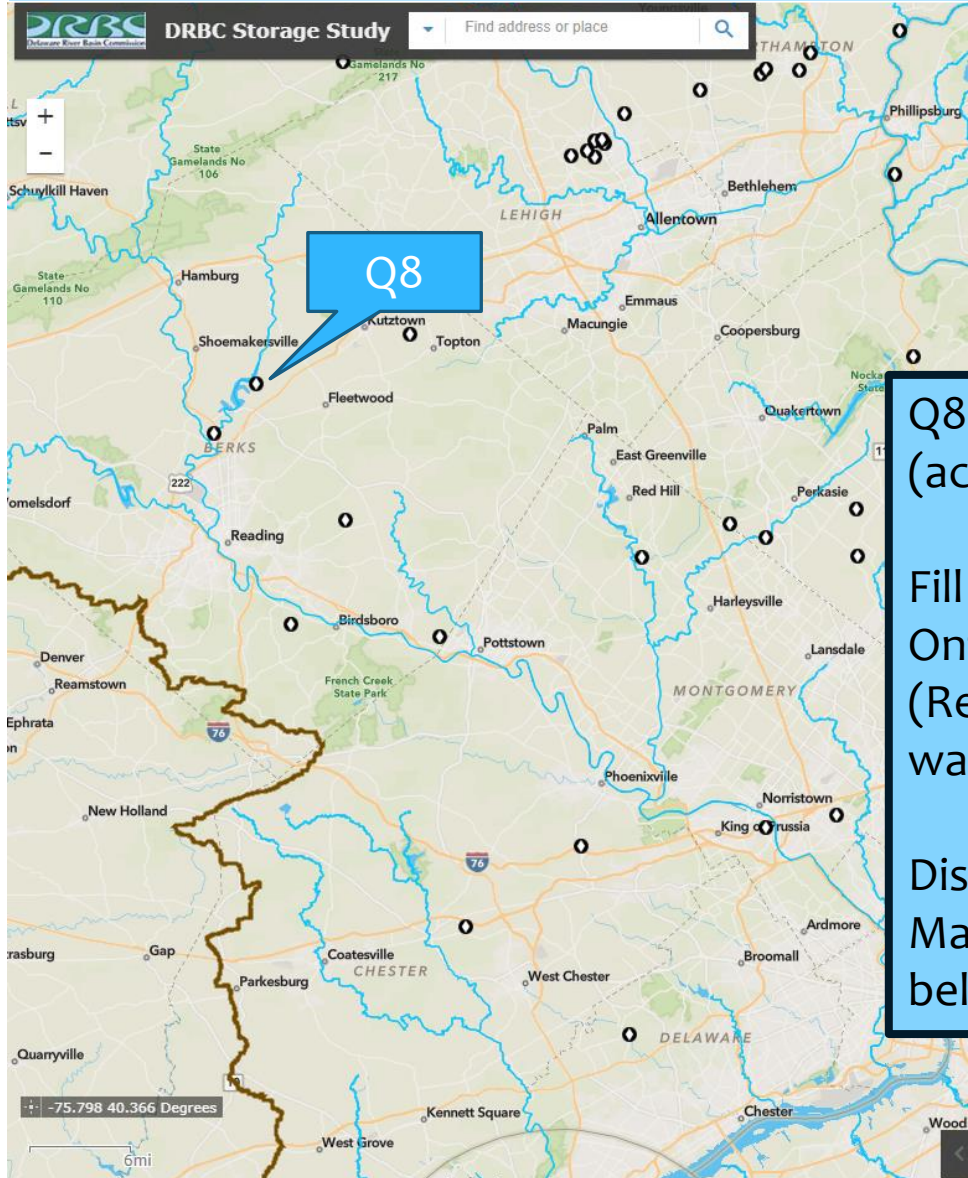


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Q8 – Holcim Evansville Quarry



Q8: ~ 3.1 BG (active)
Fill from Lake Onteluanee (Reading's source water reservoir)
Discharge to Maiden Creek below Lake O.

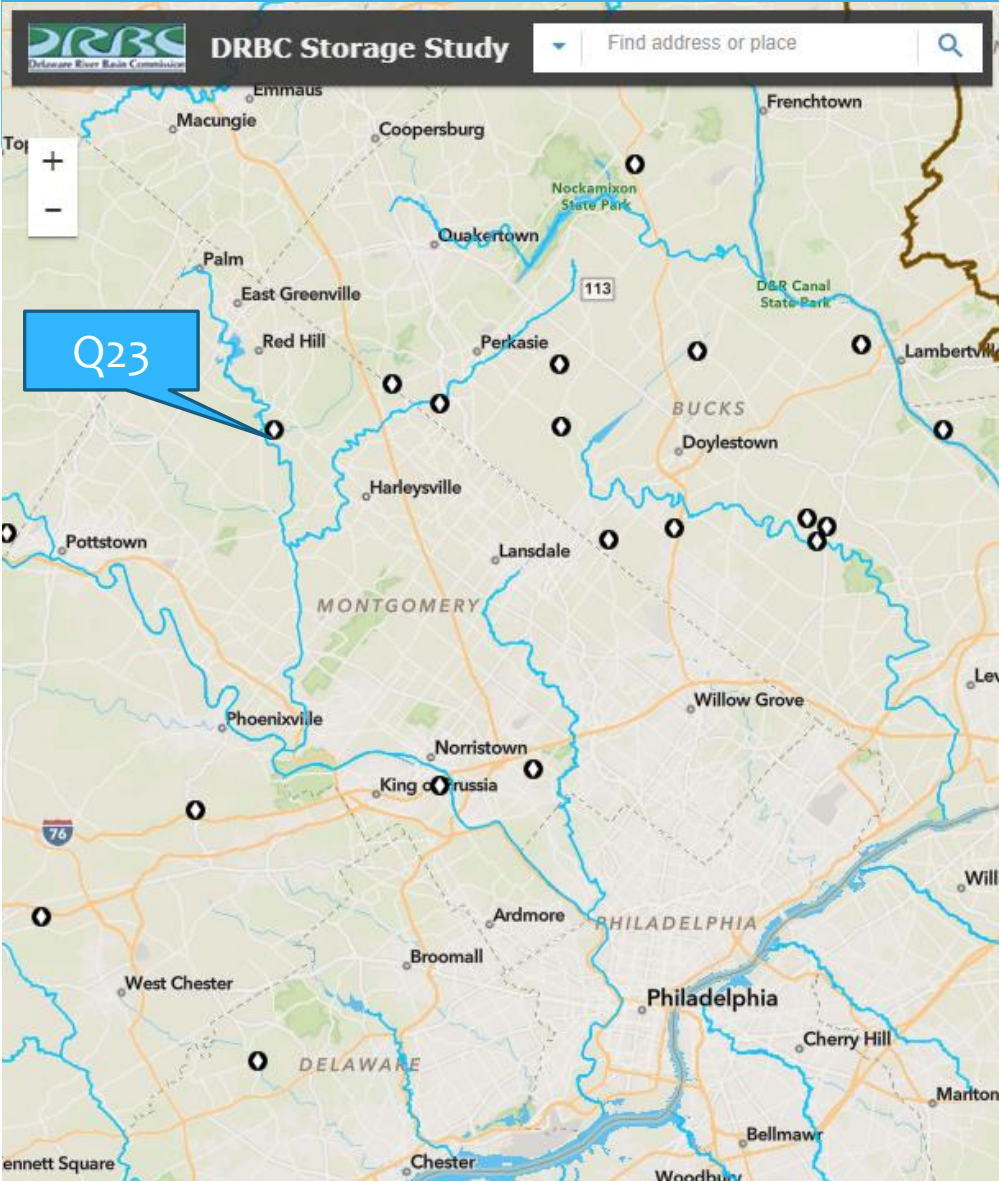
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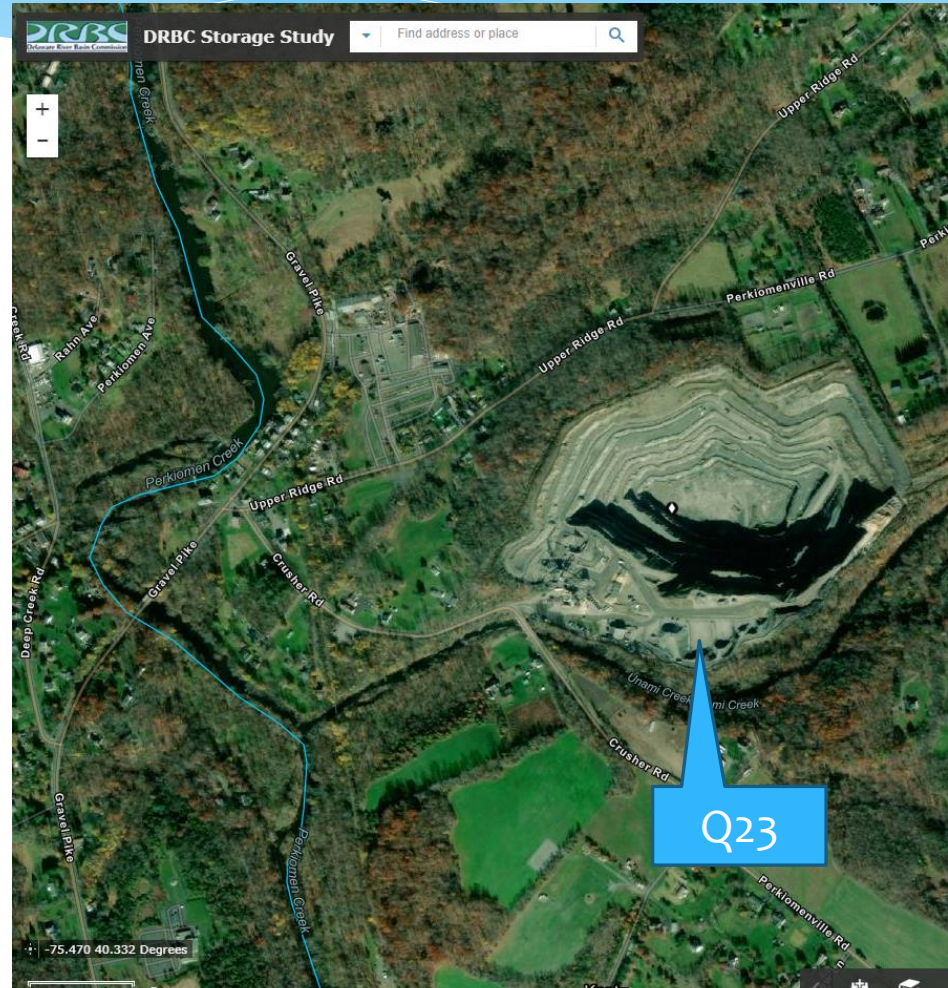
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Q23 – Perkiomenville Quarry

Q23: ~ 1 BG
(active)
Fill from Unami
Creek



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Q23 – Perkiomenville Quarry

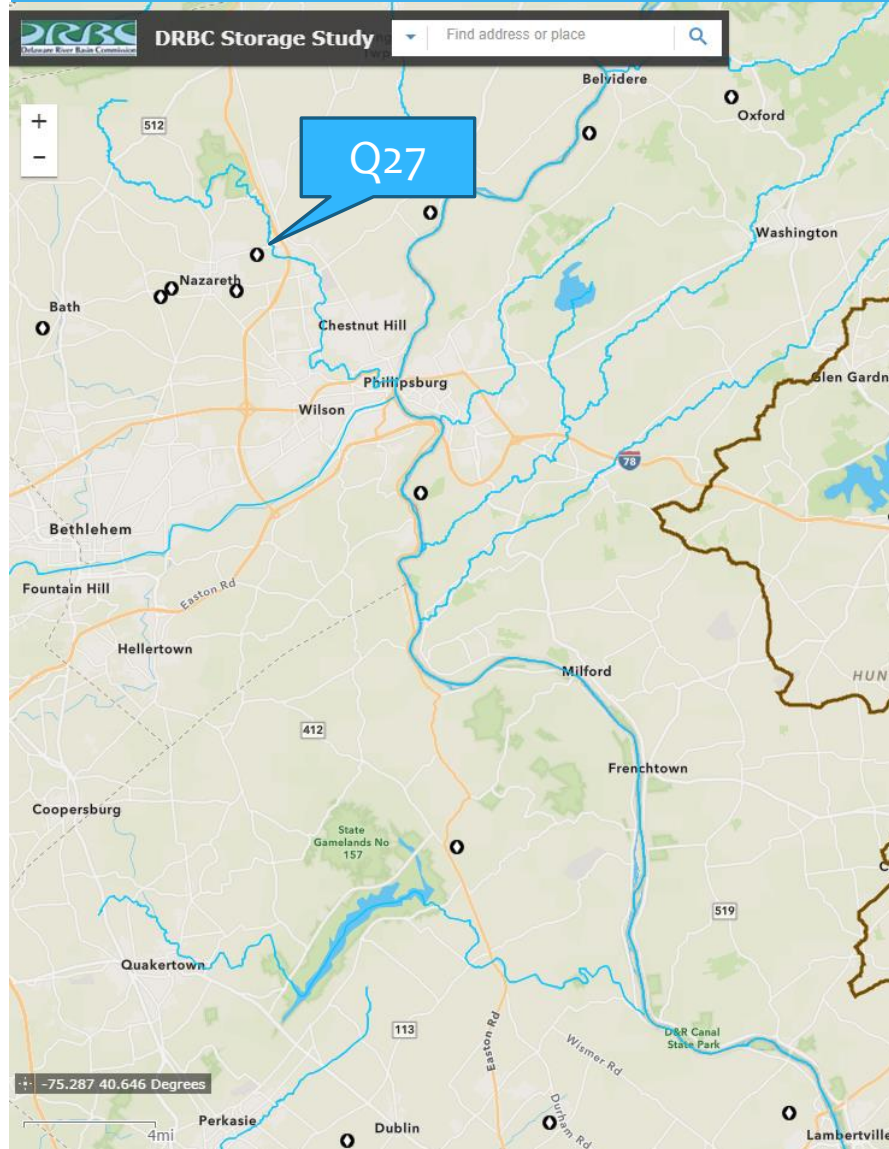
Q23: ~ 1 BG
(active)
Fill from Unami
Creek

Q23

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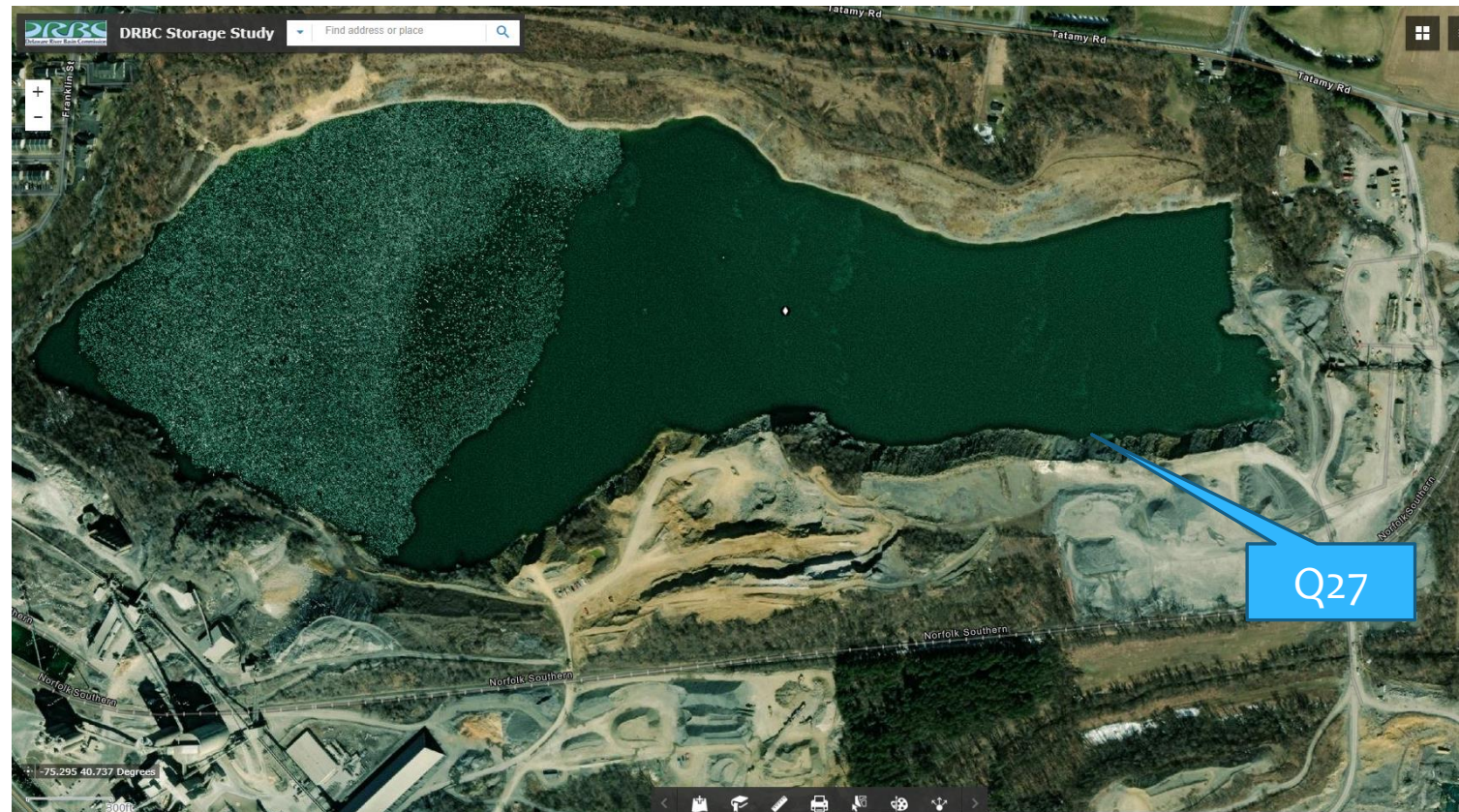


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Q27 – NESL Nazareth Quarry

Q27: ~ 1.5 BG (inactive), fill from Bushkill Creek



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for Lehigh/Northampton County, PA
County Mosaics

Q27 – NESL Nazareth Quarry

Q27

Q27: ~ 1.5 BG (inactive), fill from Bushkill Creek

Q27

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Blue Marsh Reservoir: Photo courtesy of U.S. Army Corps of Engineers

Next Steps

- * Commissioner review
- * Finalize comments and publish