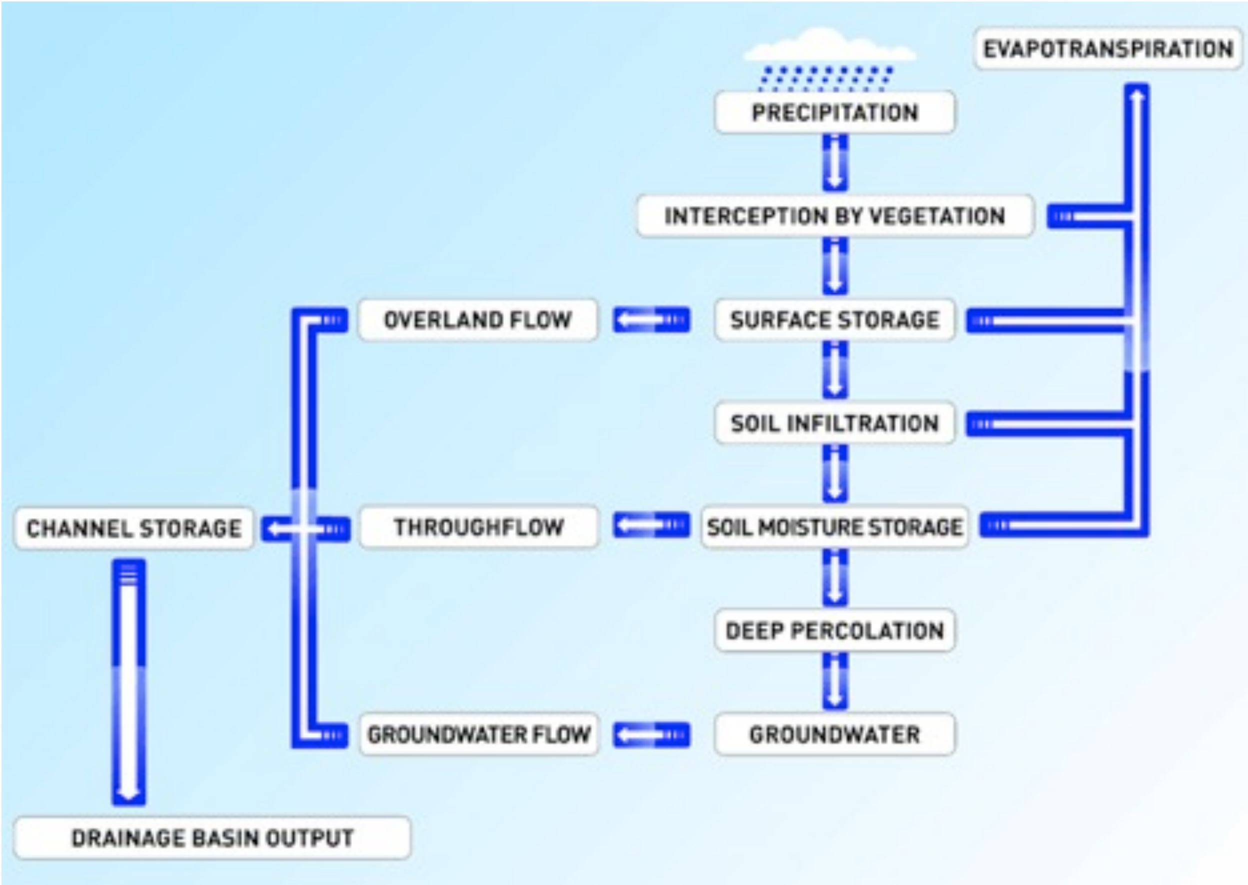
Stage-Storage Diagram

The following description is adapted from ([1]).

Inputs
The main input to Deep Creek Lake is precipitation. The type of precipitation (rain or snow, etc), the intensity, the duration and frequency all have an effect on the amount of water that flows into and is stored in Deep Creek Lake. Each subsystem of the drainage basin system will also have inputs and outputs, and the output from one stage of the diagram will form the input for another.



Storage
Water is stored in a drainage basin on the surface in lakes and channels or underground in the groundwater store. Water reaches the groundwater store via the processes of infiltration and percolation. During these processes, some water will be stored in the soil and rock. The amount of water stored will vary depending on the porosity of the soil and on the permeability of the rock. Water can also be temporarily stored via interception. This refers to the storage of water on leaf and plant stems.

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[1] BBC - Education Scotland - Rivers

Dense foliage may result in little water reaching the ground, since it often evaporates from the leaves.

Transfer
The sum of all the water flowing over the drainage basin's surface is called runoff. It is made up of streamflow, which is flow through permanent creek channels and overland flow or surface runoff. Overland flow transfers water through the basin either as sheet-wash, across the surface, or in tiny channels called rills. Beneath the surface, water is transferred via through-flow, which is the movement of water through the lower soil towards creeks, and groundwater flow. Groundwater flow is typically very slow. Water that has been intercepted by foliage may also be transferred, either directly as through-fall, or by running down branches and stems via stem-flow.

Outputs
The final release of the water in a drainage basin is known as its output. Typically, creeks flowing into rivers and eventually the sea will be the main output of a drainage basin. At Deep Creek Lake the 'river' is the release through the hydroelectric generators into the Youghiogheny river. Some water will also be lost via evapotranspiration. This process refers to direct evaporation, and also to the extent that moisture lost from leaves will result in plants withdrawing water from the soil via their roots.

Stage-Storage Diagram
The net amount of water stored in the lake is generally controlled by operating the hydroelectric turbines. The drop in the water level of the lake per fixed amount of water used by the hydroelectric facility is a function of the water level of the lake. To be able to assess how much drop in the water level occurs requires a knowledge of the amount of water in the lake as a function of lake level. The stage-storage diagram shows that dependency.

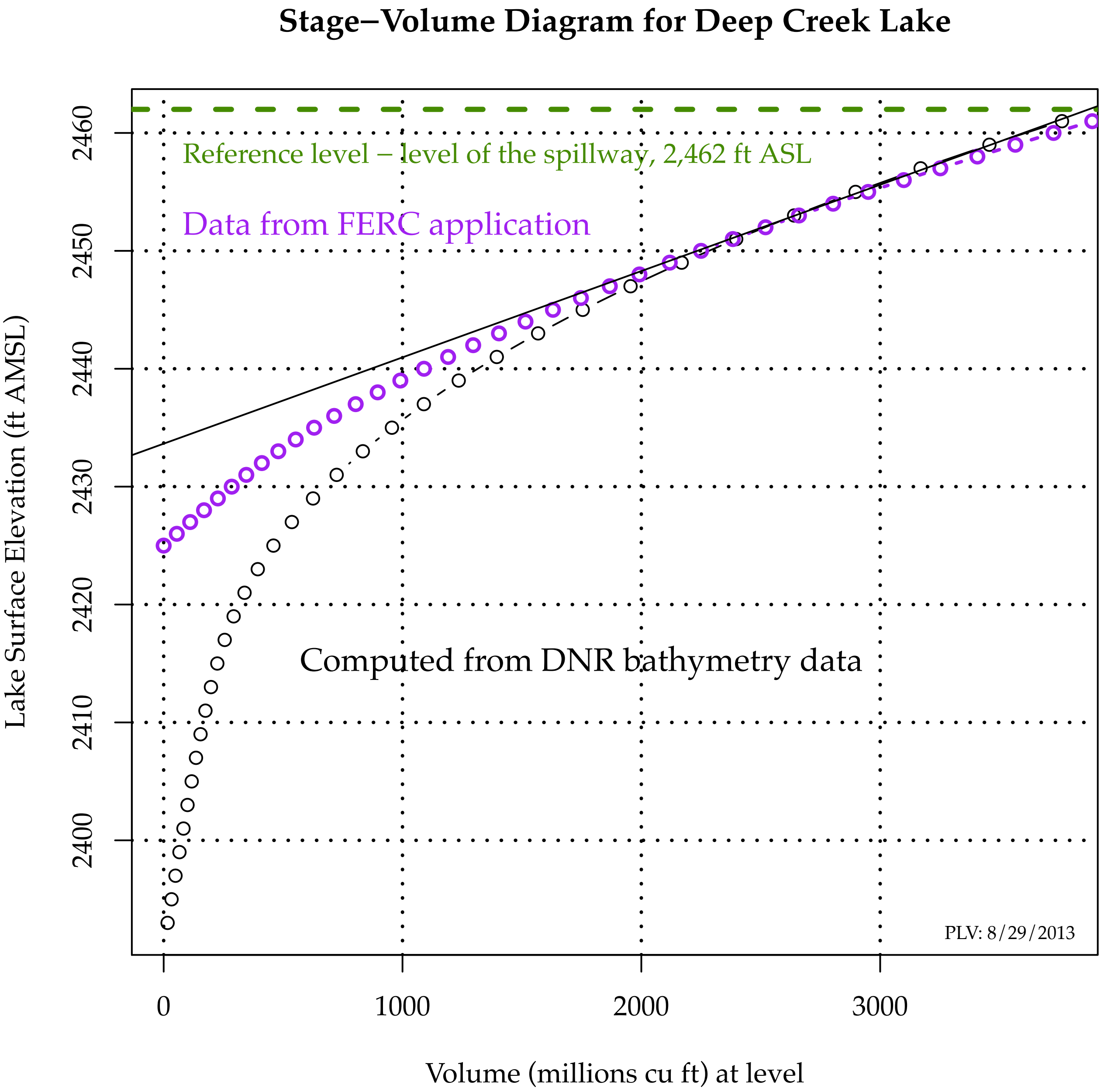
The attached figure shows the stage storage diagram as computed from the data DNR collected in the spring of 2012. Also plotted are data from the 1963 FPC application #2370 (see attached for a copy of the relevant page).

The methodology applied is similar to the one used to develop the bathymetric maps. The lake area was overlaid with a grid of square cells for which an average depth was computed using Akima's interpolation procedure for irregularly spaced data (the DNR data). Next, at two foot depth intervals, the number of cells whose depth fall above the appropriate levels were calculated, and knowing the cell areas, its straight forward to calculate the total area above those lake levels. Next, these areas were integrated with respect to the two-foot interval depth values, using the trapezoidal rule, giving the water volumes above the appropriate water levels. These are the data plotted in the attached graphs.

Note that the two sets of data, DNR and PFC, agree very well down to a lake level of about 2,450 ft

It is not clear why there is a difference at lower levels, because it should have been known that there is water in the lake at levels less than the last entry in their table, 2,425 feet of elevation (the bathymetry shows that there is water down to 2,387 ft). Perhaps the table expresses the usable quantity of water for the hydroelectric facility, since coincidentally (?) the lowest level listed in the FPC data is about the same as the level of the water at the top of the power tunnel intake that leads to the turbines (see the attached drawing).

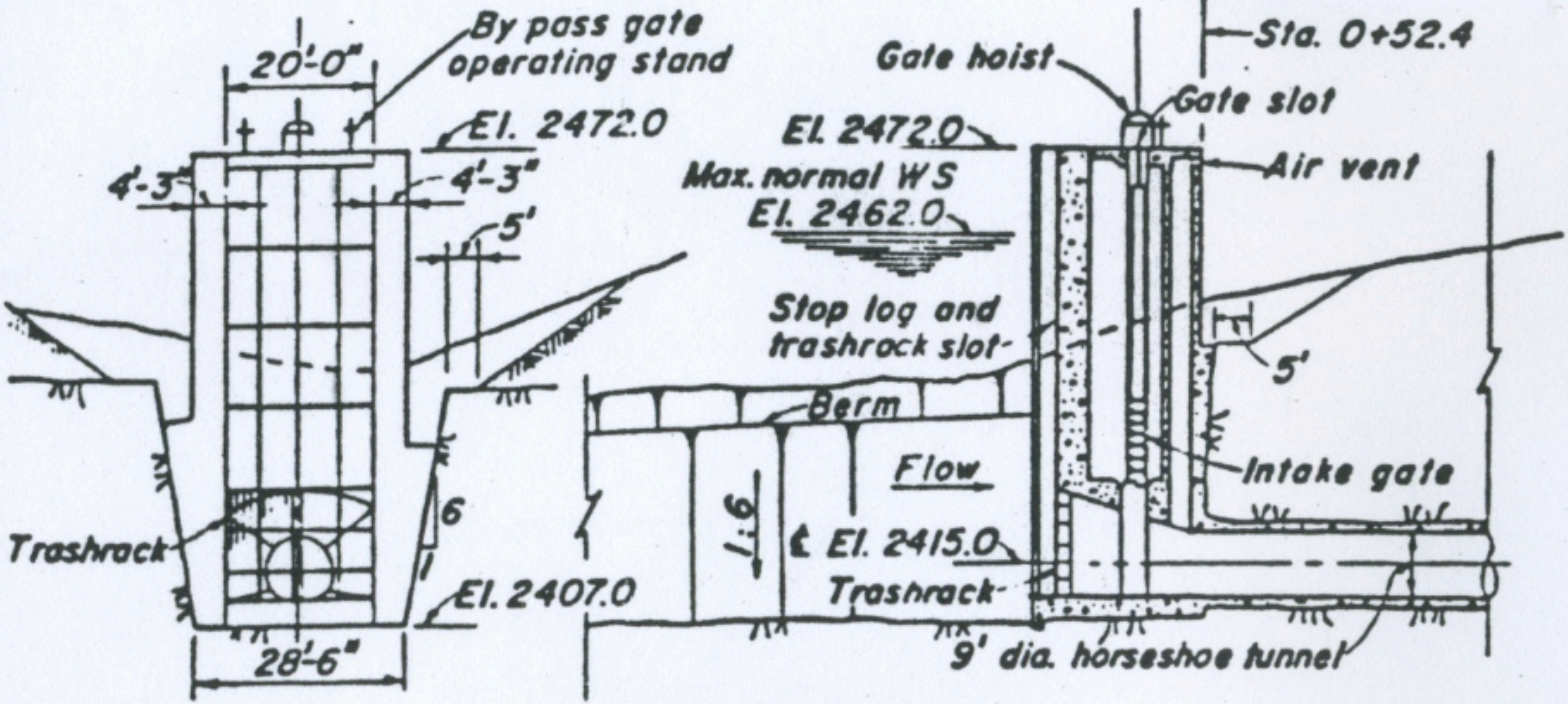
PLV: 2013/08/30



Stage−Volume Diagram for Deep Creek Lake
Reference level − level of the spillway, 2,462 ft ASL
Data from FERC application
Computed from DNR bathymetry data
PLV: 8/29/2013
Lake Surface Elevation (ft AMSL)
Volume (millions cu ft) at level
2400
2410
2420
2430
2440
2450
2460
0
1000
2000
3000

Pennsylvania Electric Company, Johnstown PA
Source: FPC License Application #2370
Information for Branch of River Basin Studies, Raleigh, NC
Recieve October 4, 1963 by WPCC

ELEVATION	MILLION CU. FEET	ACRE FEET
2462	4050.0	92,975
2461	3888.0	89,256
2460	3726.0	85,537
2459	3566.0	81,864
2458	3407.0	78,214
2457	3252.0	74,656
2456	3099.0	71,143
2455	2950.0	67,722
2454	2803.0	64,348
2453	2660.0	61,065
2452	2520.0	57,851
2451	2383.0	54,706
2450	2250.0	51,653
2449	2119.0	48,646
2448	1992.0	45,730
2447	1868.0	42,883
2446	1747.0	40,106
2445	1630.0	37,420
2444	1515.0	34,780
2443	1404.0	32,231
2442	1296.0	29,752
2441	1191.0	27,342
2440	1090.0	25,023
2439	991.0	22,750
2438	896.0	20,569
2437	804.0	18,457
2436	714.0	16,391
2435	630.0	14,463
2434	553.0	12,695
2433	480.0	11,019
2432	411.0	9,435
2431	346.0	7,943
2430	285.0	6,543
2429	227.0	5,211
2428	169.0	3,880
2427	111.0	2,548
2426	55.0	1,263
2425	.0	0



POWER TUNNEL INTAKE

0 20 40 60 80 100 120

1 inch = 20 feet