PUBLIC HEARING FOR GROUNDWATER APPROPRIATION PERMIT APPLICATION CH1972G002/6

Swan Point Water System
Charles County, Maryland

February 20, 2007

Presented By:

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Centreville, Maryland

And

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GAP Application (CH1972G/06) Seeks To Increase Permitted Withdrawals

CURRENT:

60,000 gallons per day (gpd) annual average withdrawal and 100,000 gpd during the month of maximum use from **two existing** Patapsco aquifer wells.

PROPOSED:

500,000 gpd annual average withdrawal and

1,000,000 gpd during the month of maximum use from **two existing and one future** Patapsco aquifer wells.

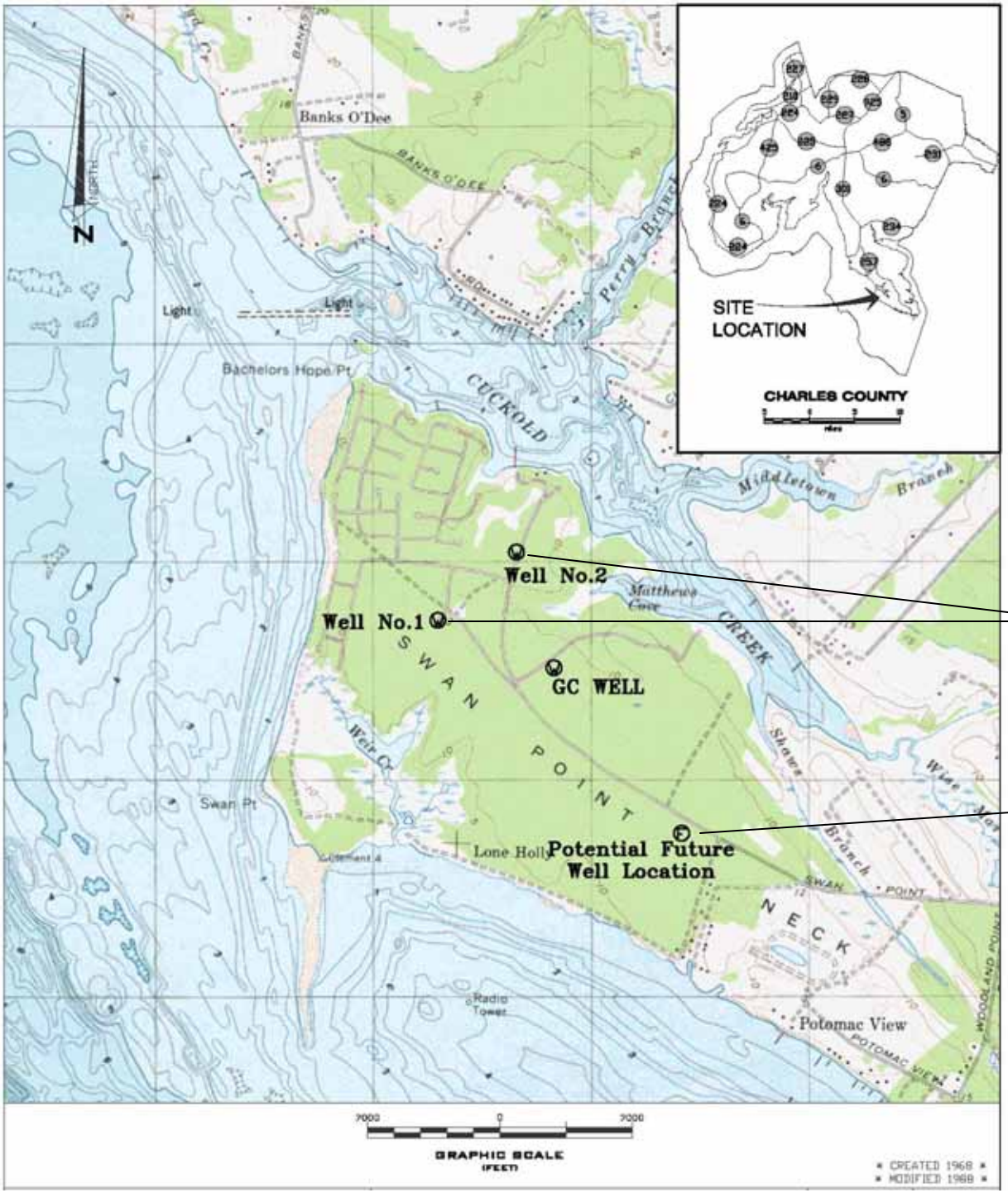
Purpose Of the Requested Increase in Permitted Withdrawals:

- To meet the projected system demands over the next 12 years (typical length of a GAP permit).

  NOTE: System build-out is expected to occur within approximately 10 years.

- The addition of a third Patapsco aquifer well will provide sufficient reserve capacity for the Swan Point system for the duration of the GAP permit.

- All wells will be operated and maintained by the Charles County DPW.

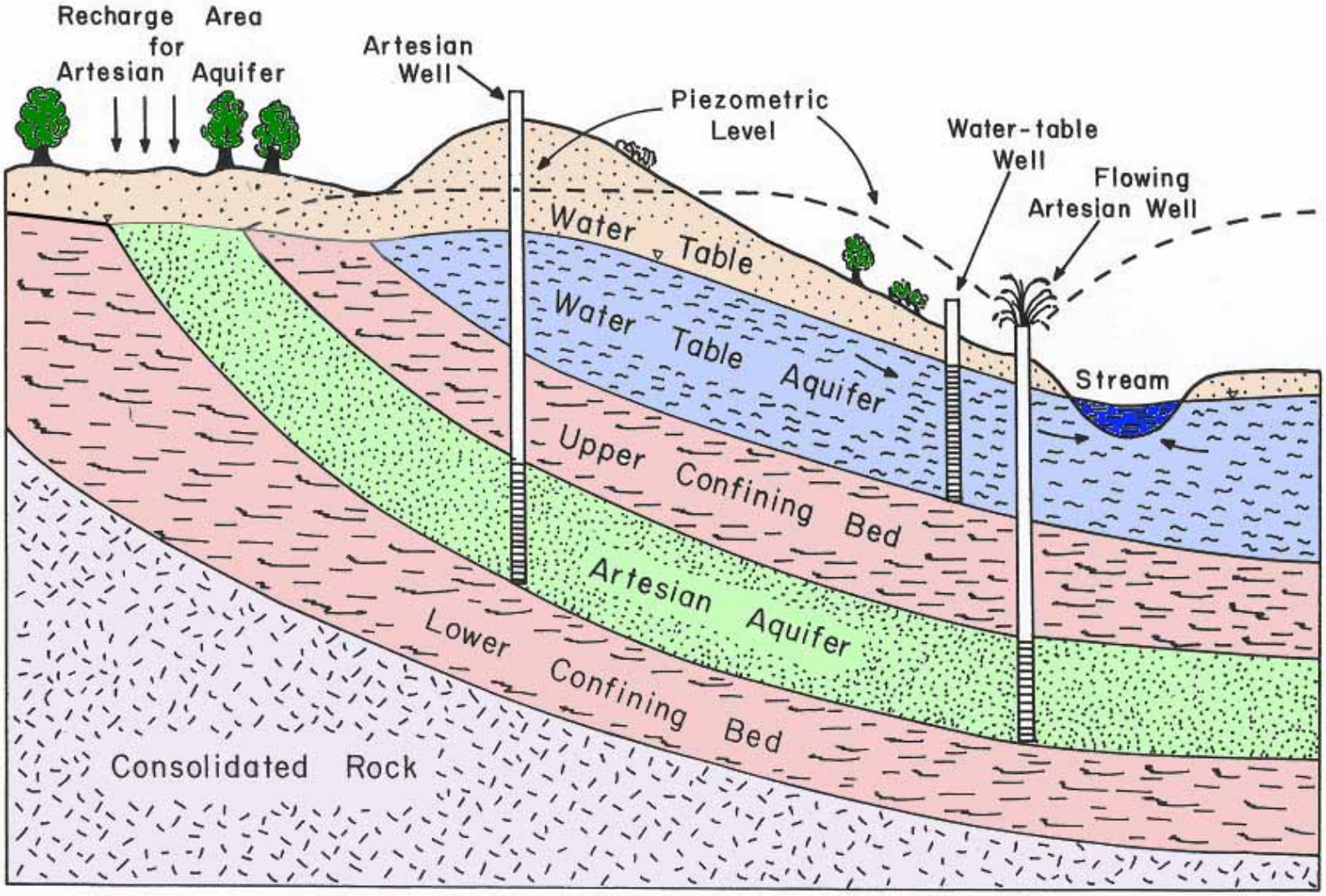


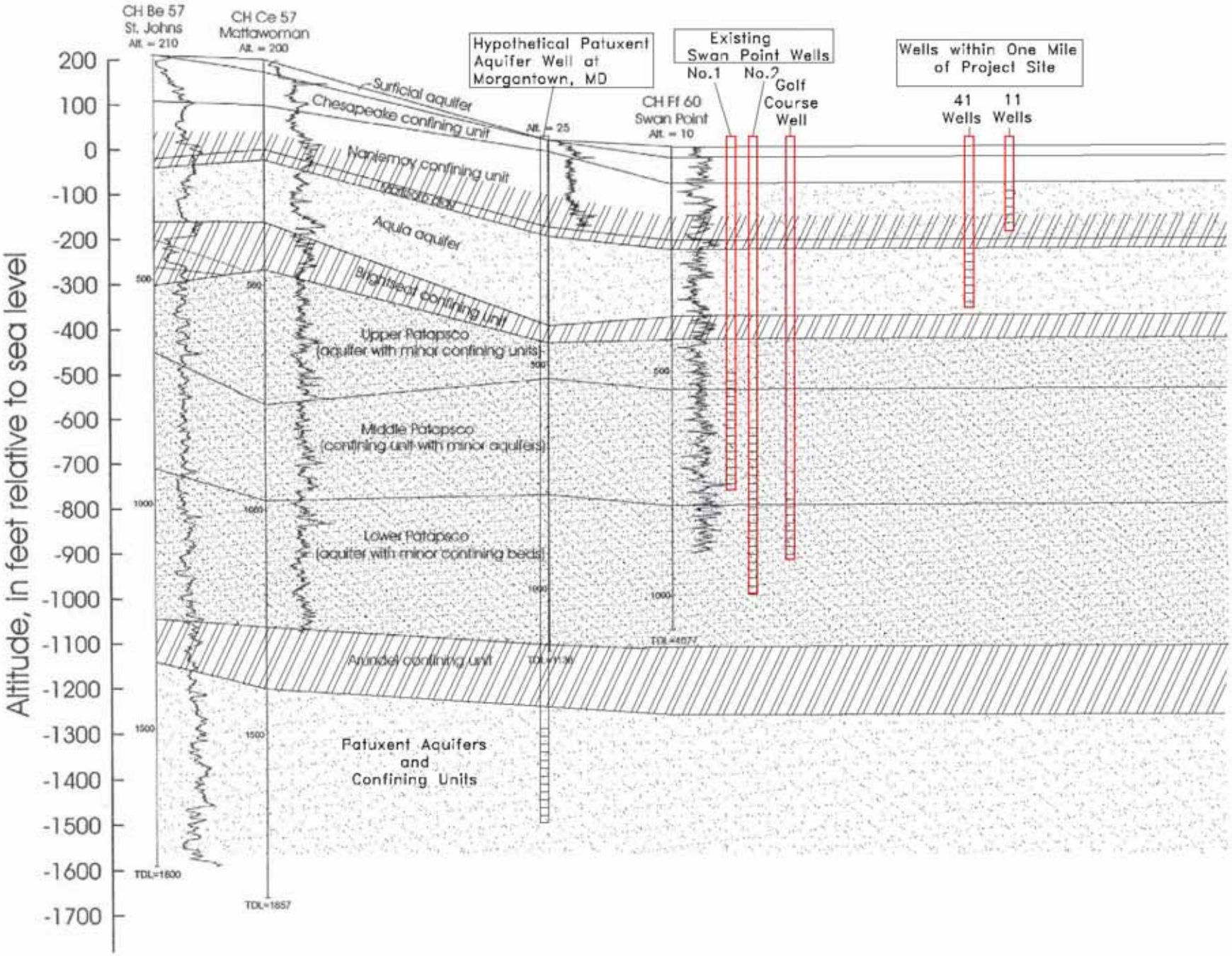
- Ultimately, withdrawals will be made from three separate Patapsco aquifer wells.
  - Two existing Patapsco aquifer wells
  - One future Patapsco aquifer well.

Hydrogeologic Framework

- Swan Point is located within the Atlantic Coastal Plain physiographic province- sedimentary sand, silt and clay deposits that thicken and dip toward the Atlantic Ocean.
- Estimated depth to bedrock- approximately 1,800 feet at Swan Point.
- Patapsco aquifer is an important source of groundwater supply in Charles County.
  - River-delta environment of late Cretaceous age (approximately 65.5–146 million years ago).
- Deep aquifers are “confined” by over and underlying low permeability layers (clay and silt).

Generalized Hydrogeologic Cross-Section




CH Be 57
St. Johns
Alt. = 210
CH Ce 57
Mattawoman
Alt. = 200
Hypothetical Patuxent Aquifer Well at Morgantown, MD
Existing Swan Point Wells
No.1
No.2
Golf Course Well
Wells within One Mile of Project Site
41 Wells
11 Wells
CH Ff 60
Swan Point
Alt. = 10
Alt. = 25
Surficial aquifer
Chesapeake confining unit
Nanjemoy confining unit
Aquia aquifer
Brightseat confining unit
Upper Patapsco
(aquifer with minor confining units)
Middle Patapsco
(confining unit with minor aquifers)
Lower Patapsco
(aquifer with minor confining beds)
Arundel confining unit
Patuxent Aquifers
and
Confining Units
TDL=1600
TDL=1657
TDL=1577
Altitude, in feet relative to sea level
200
100
0
-100
-200
-300
-400
-500
-600
-700
-800
-900
-1000
-1100
-1200
-1300
-1400
-1500
-1600
-1700

Groundwater Appropriation Permit (GAP) Process

- Determine Aquifer Parameters of transmissivity (T) and storage coefficient (S).
  - Evaluate pumping test data
- Assess Water Level Trends
  - Historical pre-pumping water levels
  - Current water levels
  - MDE 80% Management level
- Evaluate Impacts Of the Proposed Withdrawals Using the Theis equation
  - On other local users
  - On the groundwater resource

Pumping Test Data Analysis

- Drawdown and recovery data from the original pumping tests that were performed when the wells were originally drilled was analyzed to determine the aquifer coefficients (T and S) that were used to predict impacts due to future pumping.

Summary of Construction Features of Two Existing Wells At Swan Point

	Well No. 1	**Well No. 2**
Year Drilled	1981	1986
Permit No.	CH73-2765	CH81-1970
Total Depth	865 feet	980 feet
Well Casing	10-inch steel x 450 feet	10-inch steel x 450 feet
Well Screen	6-inch stainless steel (0.020” slot size x 110 feet)	6-inch stainless steel (0.020” slot size x 115 feet)

24-Hour Constant Rate Pumping Tests

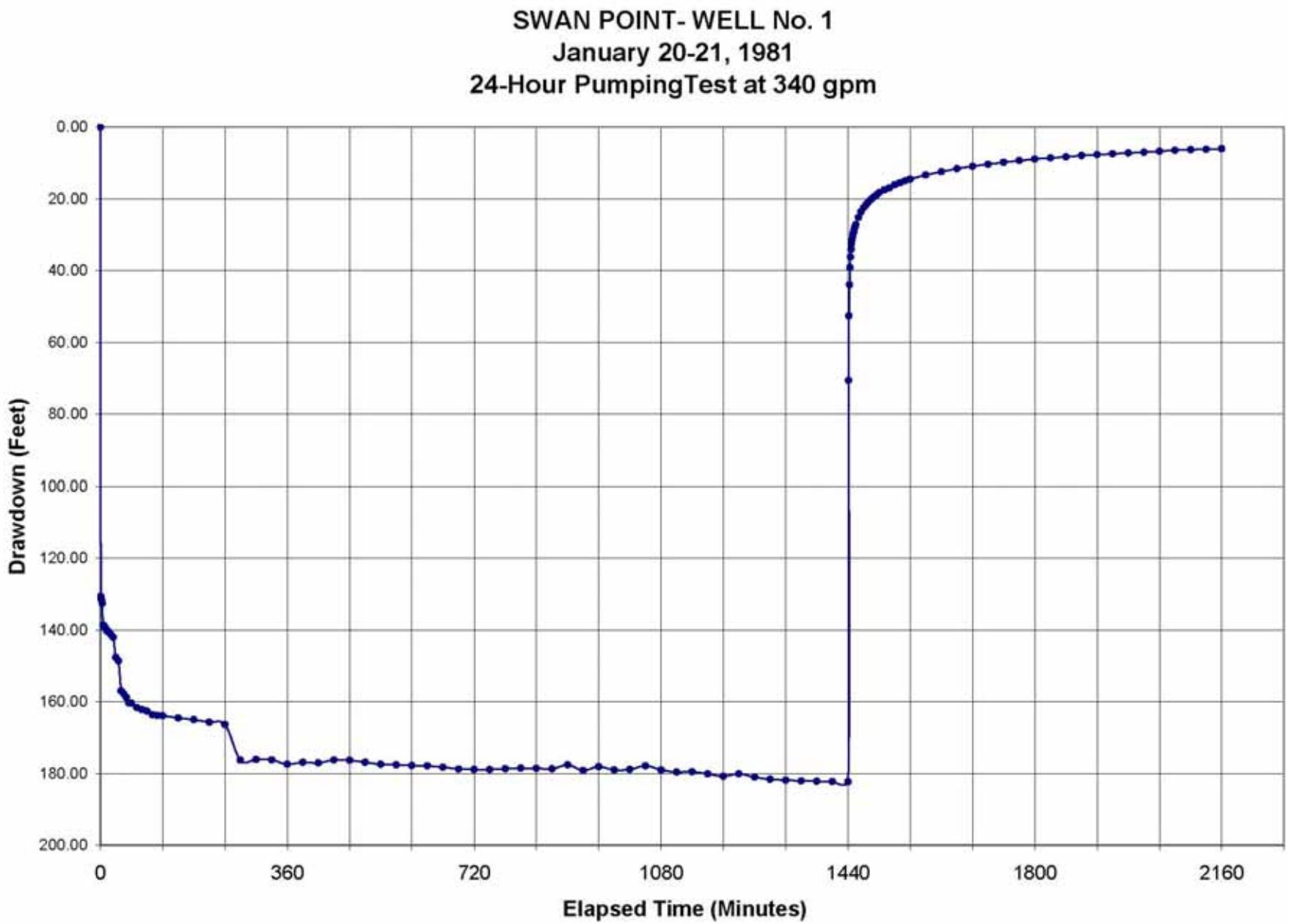
(Data used to determine aquifer coefficients to predict impacts of future pumping)

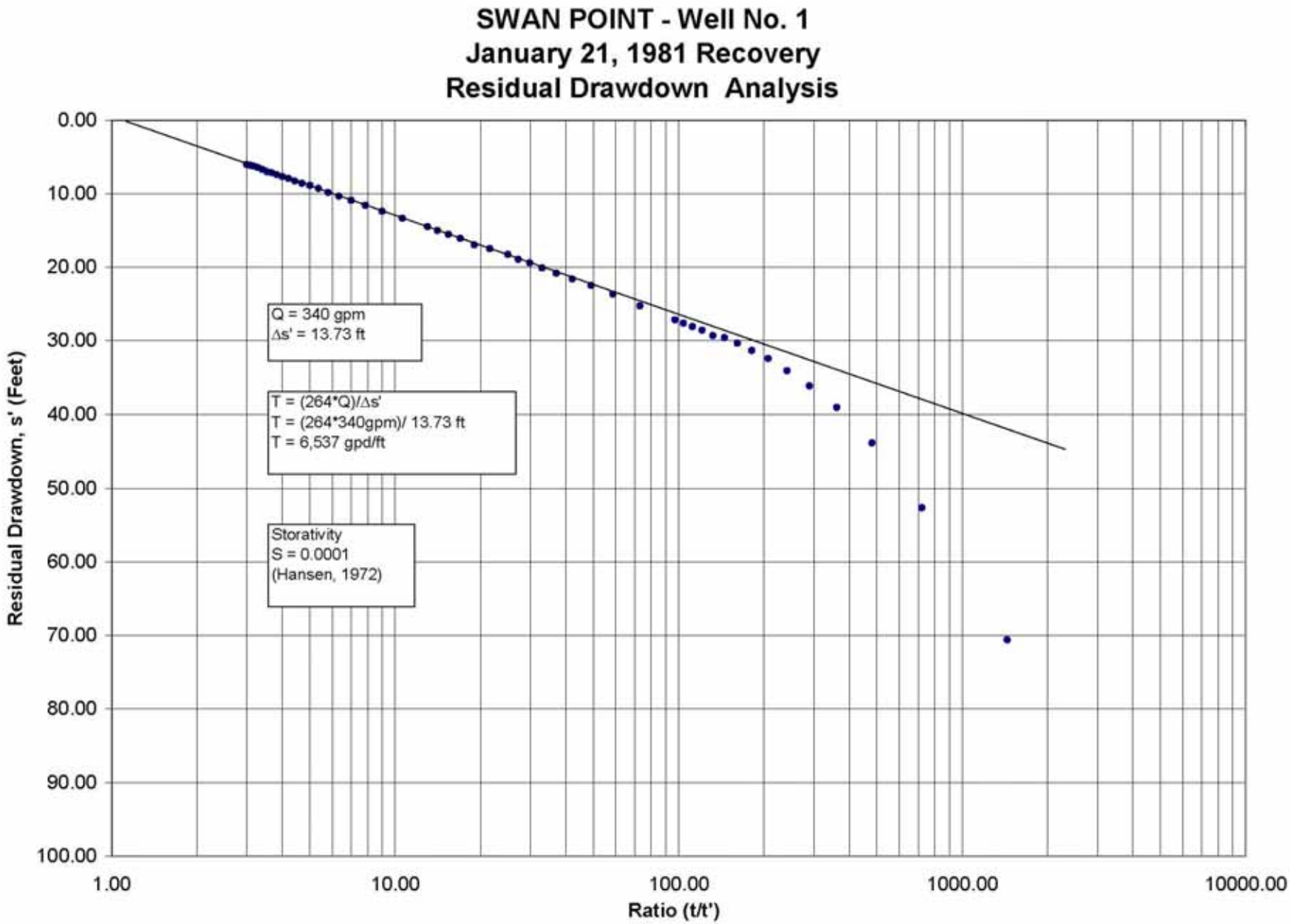
Well No. 1 Pumping Test

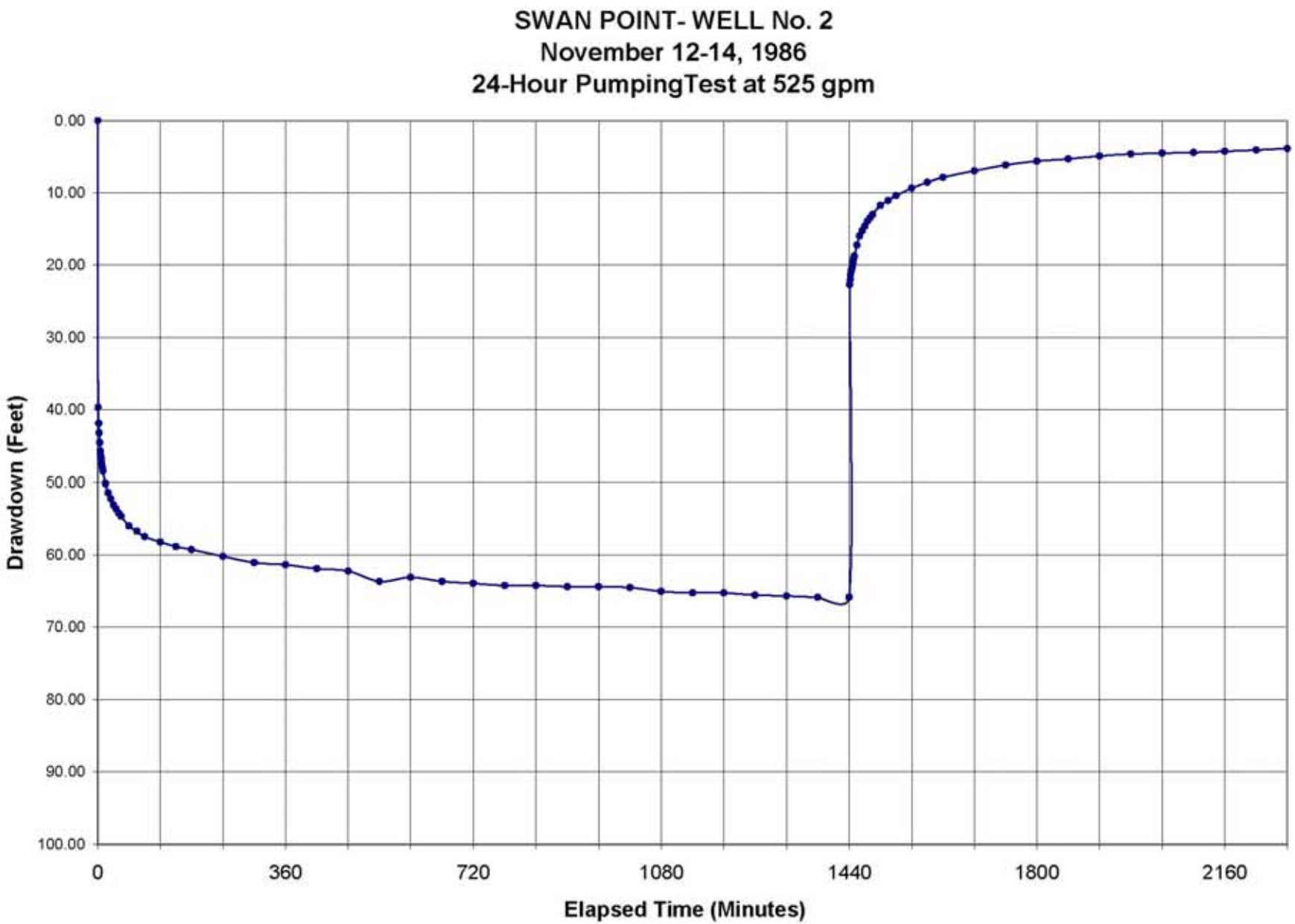
- Conducted January 1981.
- Pumping rate: 340 gpm.
- Pumped continuously for 24 hours.
- Pre-test static water level- 19.42 feet.
- Maximum drawdown in Well No. 1: 182.27 feet.
- Recovery measured for 12 hours after pumping stopped.

Well No. 2 Pumping Test

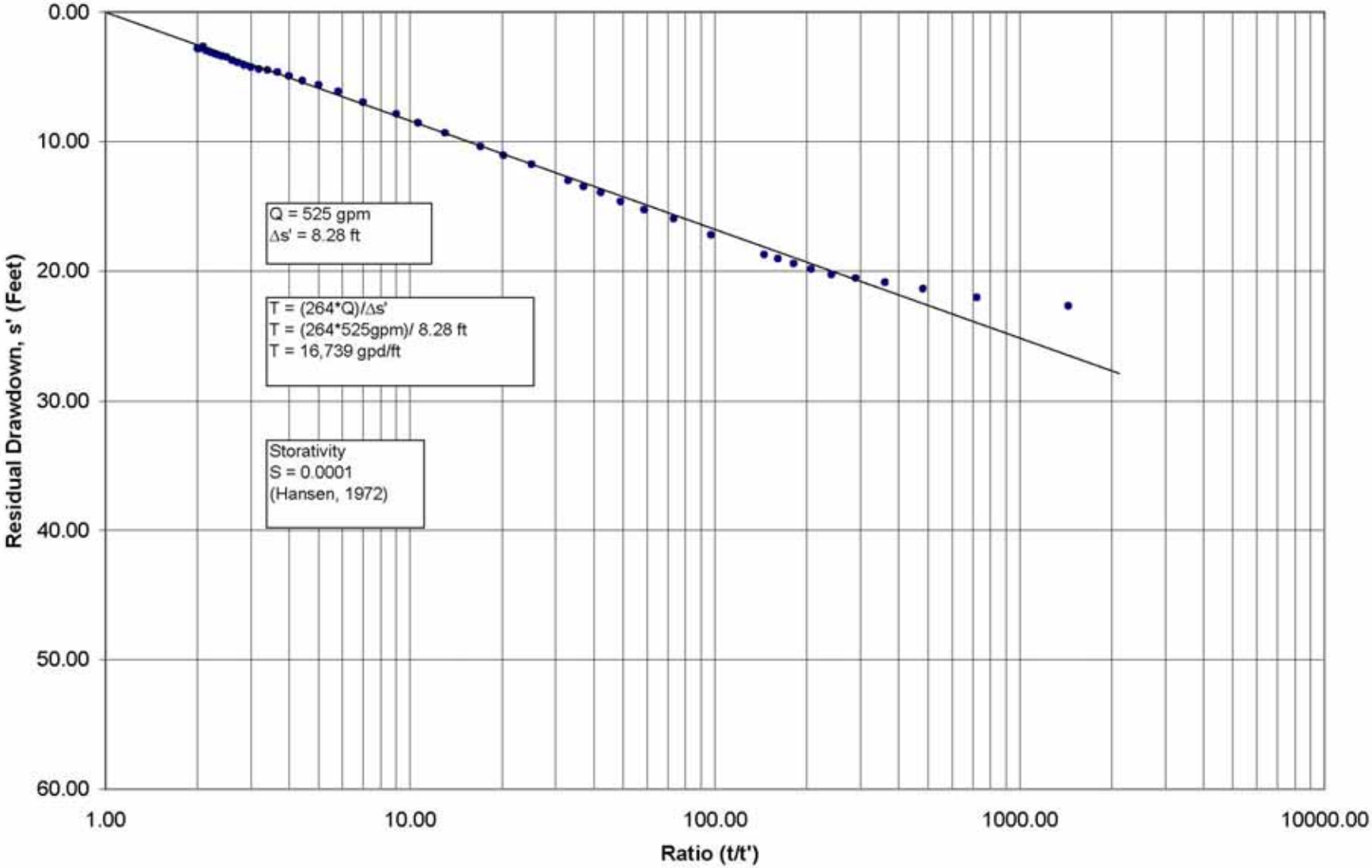
- Conducted November 1986.
- Pumping rate: 525 gpm.
- Pumped Continuously for 24 hours.
- Pre-test static water level- 27.46 feet.
- Maximum drawdown in Well No. 2: 65.83 feet
- Recovery measured for 24 hours after pumping stopped.


SWAN POINT- WELL No. 1
January 20-21, 1981
24-Hour PumpingTest at 340 gpm
Drawdown (Feet)
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
0
360
720
1080
1440
1800
2160
Elapsed Time (Minutes)


SWAN POINT - Well No. 1
January 21, 1981 Recovery
Residual Drawdown Analysis
Q = 340 gpm
Δs' = 13.73 ft
T = (264*Q)/Δs'
T = (264*340gpm)/ 13.73 ft
T = 6,537 gpd/ft
Storativity
S = 0.0001
(Hansen, 1972)
Residual Drawdown, s' (Feet)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
1.00
10.00
100.00
1000.00
10000.00
Ratio (t/t')


SWAN POINT- WELL No. 2
November 12-14, 1986
24-Hour PumpingTest at 525 gpm
Drawdown (Feet)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
0
360
720
1080
1440
1800
2160
Elapsed Time (Minutes)

SWAN POINT - Well No. 2
November 14, 1986 Recovery
Residual Drawdown Analysis



Calculated Aquifer Coefficients

Well	Transmissivity (gpd/ft)
Well No. 1	6,537
Well No. 2	16,741
Average	11,639

- Aquifer transmissivity values calculated from the pumping test data are within the range of values reported in published literature for the area.

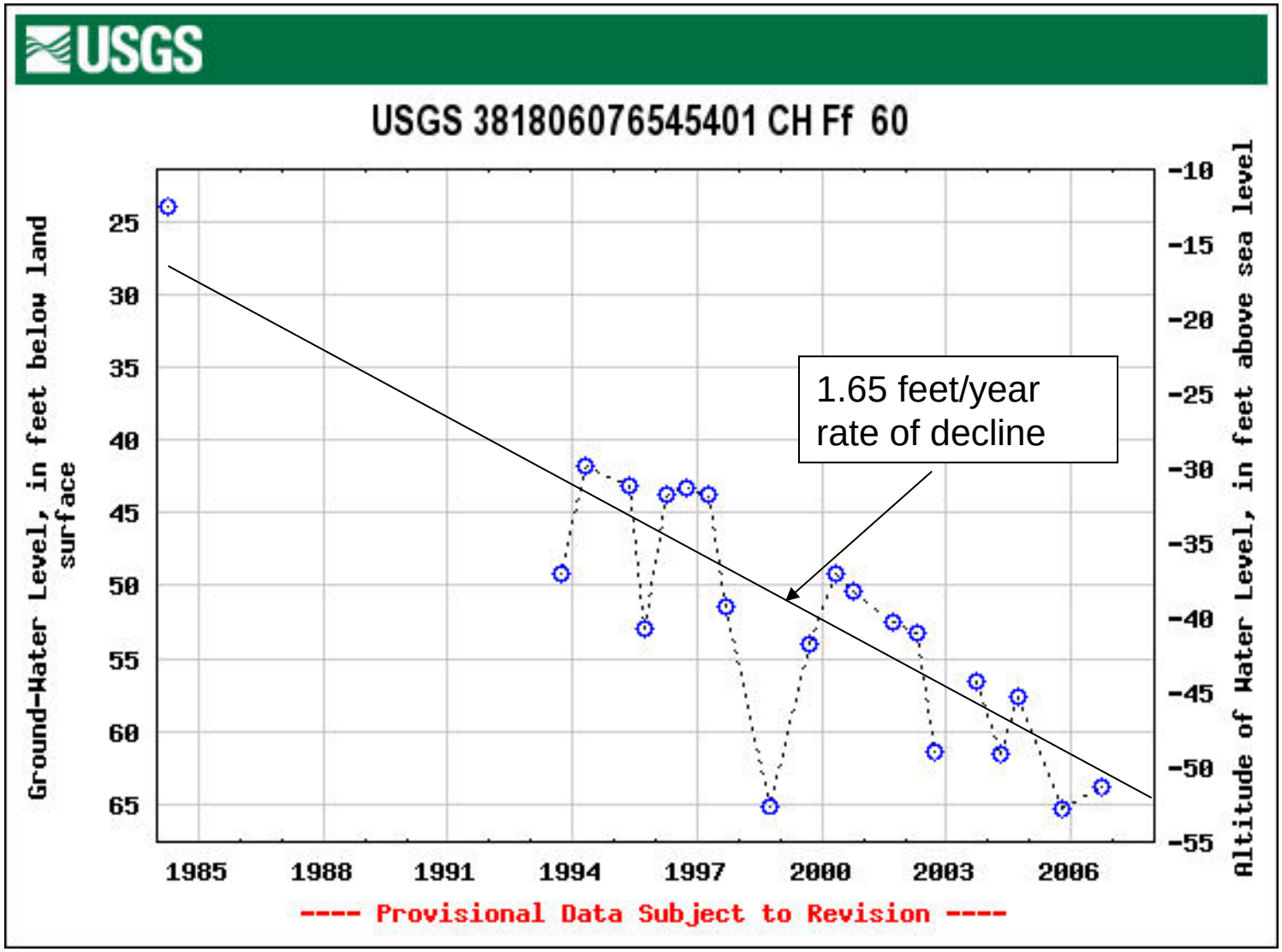
- Storativity = 0.0001

(Based on MGS publications)

Evaluation of Water Level Trends

- Review published data
  - National Water Information System Database maintained by the U.S. Geological Survey.
- Establish or confirm the 80% regulatory management level.
- Determine current water level trends in the aquifer water prior to GAP impacts.

USGS Observation Well CH-Ff 60 at Swan Point (Patapsco aquifer)



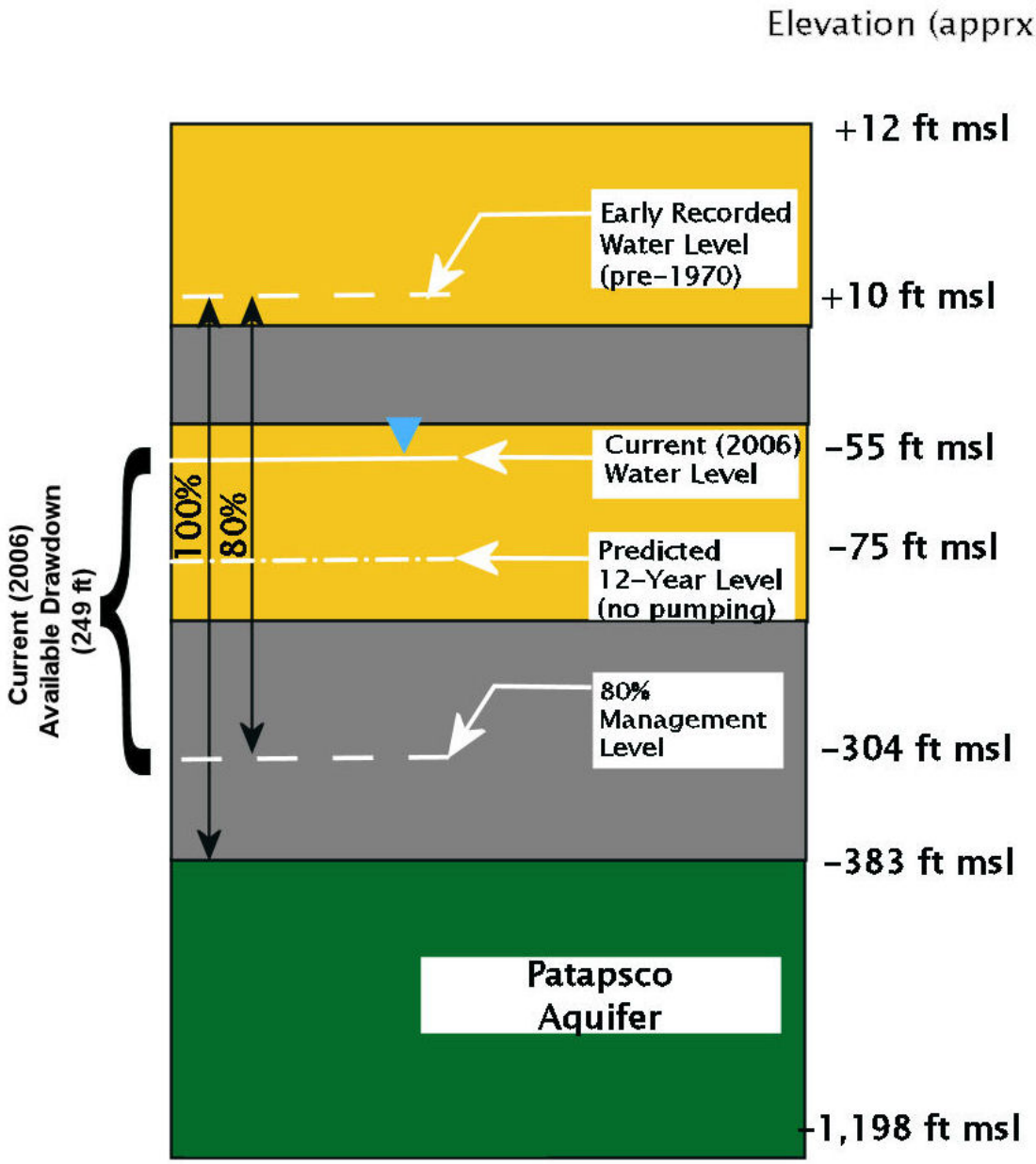
Summary Of Water Level Trends In The Patapsco Aquifer

USGS CH-Fe5 at Swan Point: 1.43 feet/year
USGS CH-Ff60 at Swan Point: 1.65 feet/year

Conservative estimate of 1.65 ft/year of water level decline in the Patapsco aquifer is used to predict future water levels.

The trend suggests that at the present rate of increasing withdrawals the water level in the Patapsco aquifer will decline approximately 20 feet in the next 12 years.

PATAPSCO AQUIFER WATER LEVELS
(Not to Scale)



80% Management Level

Elevation of the historic pre-pumping water level +

[Elevation of the pre-pumping water level – elevation top of aquifer] x 80%

+12 + [(-383 - +12) * 0.8]

= **-304 ft msl**

Predicted Future Water Level Prior to GAP Implementation

-55 – (1.65 ft/yr x 12 years) = -75 ft msl

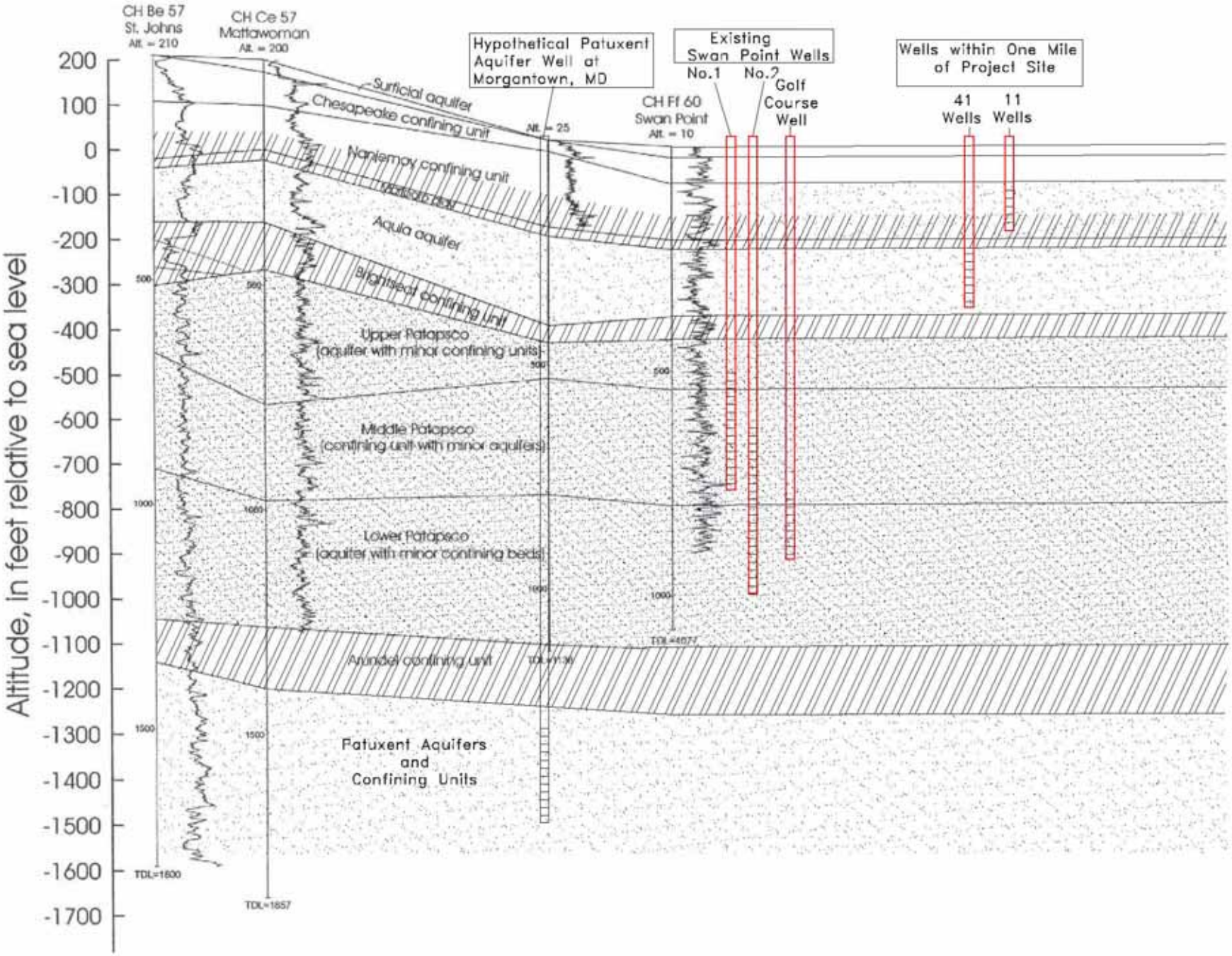
Future Available Drawdown in 12 years:

229 feet above the 80% management level

Evaluation of Pumping Impacts

- <u>Inventory wells in the area</u>
  - Total of 55 water supply wells included on MDE database within one (1) mile radius of a centrally located hypothetical well at Swan Point.
    - 11 shallow Nanjemoy aquifer supply wells.
    - 41 Aquia aquifer supply wells
    - 3 Patapsco aquifer wells (Swan Point Wells)

- <u>Assess water level impacts to wells:</u>
  - In other aquifers
  - In the Patapsco aquifer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-1400
-1500
-1600
-1700

Analysis of Impacts to Wells in Other Aquifers:

- **<u>Conclusion: No impacts to other aquifers for the following reasons:</u>**
  - Substantial impermeable clay layers of the Brightseat Formation underlie the Aquia aquifer and separate it from the Patapsco aquifer.
  - Substantial impermeable layers of the Arundel Clay underlie the Patapsco aquifer and separate it from the Patuxent aquifer.
  - MGS models do not show any aquifer connection.

Evaluation of the Long Term Regional Impacts to the Patapsco Aquifer

Notes:

- Only the increased drawdown due to the changes in the existing GAP are evaluated. The impacts of the existing withdrawals, and other pumping, are included in the observed trends.
- Water level impacts are typically not assessed at the well, but at the property or water service area boundary.
- The total withdrawals will be apportioned between three wells (two existing and one future well). However, in order to simulate the impacts of the proposed withdrawals a single hypothetical well located near the center of the three wells was used.

Evaluation of the Long Term Regional Impacts to the Patapsco Aquifer

- Next closest Patapsco aquifer water service area to Swan Point is in Newburg, MD (approximately 6 miles from the centrally located hypothetical well).

- The maximum amount of drawdown predicted at half the distance to Newburg (3 miles) after 12 years of continuous pumping at 500,000 gpd with no aquifer recharge or leakance is approximately **22 feet.**

- Even with this additional drawdown there would still be approximately 207 feet of available drawdown above the MDE 80% management level (249' – 22' -20') after 12 years of continuous withdrawals.

CONCLUSIONS

- Conservative analytical techniques were used to predict impacts.
- Requested withdrawals are reasonable and based on need.
- Proposed withdrawals are projected to cause a small decline in the water level in the Patapsco aquifer in the vicinity of the site.
- Proposed withdrawals will have no impact on wells in the shallow aquifers above the Patapsco aquifer or the deeper Patuxent aquifer.
  - Most area residential wells are in the shallower Aquia aquifer.
- Proposed withdrawals will not jeopardize the natural resources of the State of Maryland or the use of the groundwater by other parties.