



March 22, 2017

Mr. Grant Scavello
US EPA, Region 3
1650 Arch Street
Philadelphia, PA 19103

RE: Sedat #3A UIC Permit - Request for Clarification and Additional Information

Dear Mr. Scavello,

The following detail and attached triplicate documentation is in response to your March 21st email request.

- 1) Attached is a construction diagram of the Sedat #1A proposed monitor well. The intention is to plug the lower perfs and perforate the 4½" and 7" casings at Murrysville depth for monitoring. The 4½" has a logged cement top at 1,740' and the 7" is cemented to surface.
- 2) The difference in the referenced packer depths must have been related to the length of the packer which is 56¼". One was probably referencing the top of the packer and the other likely the bottom. Attachment L (attached) has been changed to match the packer depth on the diagram and include the length of the packer (1,796'). I noticed another discrepancy in the Attachment G (attached) narrative relating to the packer depth and changed it accordingly to read *approximately 1,800'*. I also changed the Murrysville Sand depth (1,822'-1,950') on the Attachment M diagram (attached) to better reflect the full sand body as detailed by the gamma.
- 3) According to our engineering consultants, it has been recommended to us to use the lower specific gravity of 1.11 and keep our max injection pressure as stated in the

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application. If you believe that a change would be in our best interest, we would be very interested to consider your reasoning.

Please do not hesitate to contact me if you need anything else.

Sincerely,



PENNECO ENVIRONMENTAL SOLUTIONS, LLC

D. Marc Jacobs, Jr.
Senior Vice President

Attachment L
Construction Procedures
Sedat #3A Injection Well

Construction Details For:

Well Name: Sedat #3A
Location: Plum Boro, Allegheny Co, PA
(See AOR Map for Well Location)

Drilling Program:

The Sedat #3A injection well will be a repurposed depleted natural gas well that was drilled through the Upper Devonian Bradford Sands to a total depth of 4,320' and after depletion plugged back to 1,940' to just below the Murrysville injection zone.

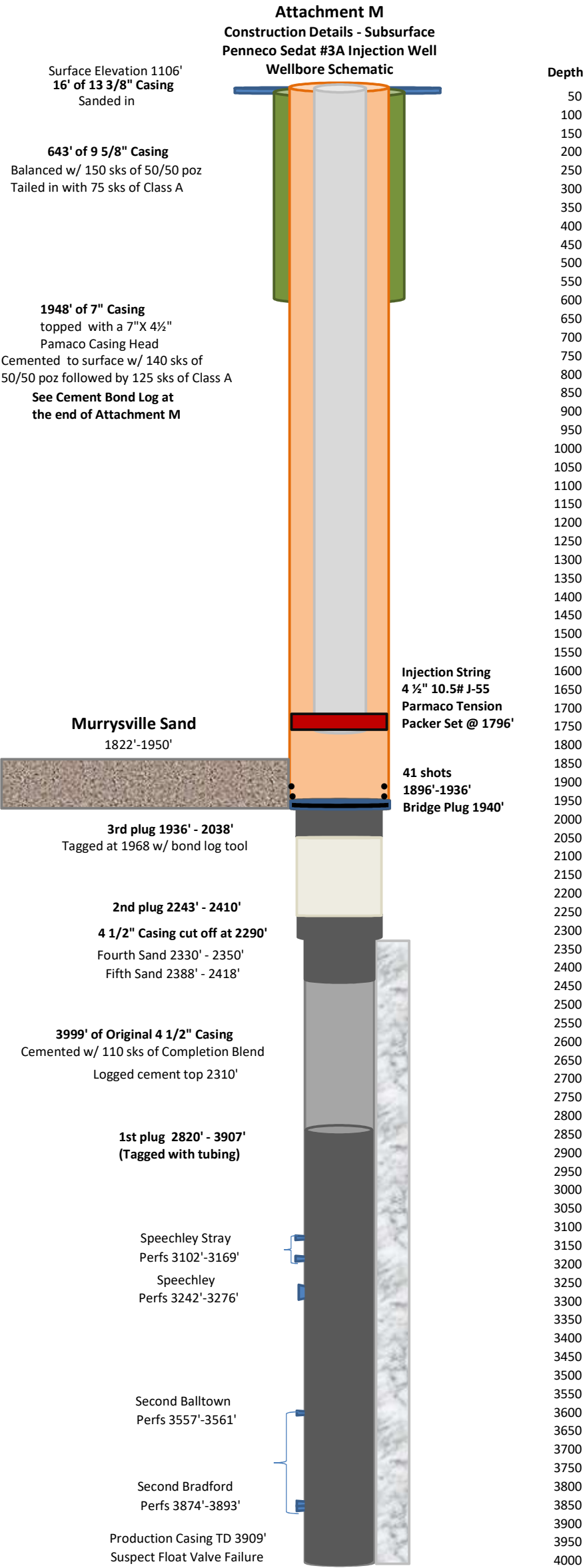
The Sedat #3A was rotary air drilled with drilling operations starting on 1/25/1989 and finishing on 2/1/1989 on reaching a Total Depth of 4,350'. The company installed 16' of 13 3/8" casing as conductor pipe which was sanded in, 643' of 9 5/8" casing cemented to surface, 1,948' of 7 " casing cemented to surface, and 3,903' of 4 1/2" casing cemented to 2,310'. Three sand formations were hydrofracked and the well was produced until 2015 through the 4 1/2" casing when the well was taken out of service because of low production. The company plugged back the Sedat #3 to a depth of 1940' in accordance with Pennsylvania Department of Environmental Protection regulations. The uncemented portion of the 4 1/2" casing was removed, three cement plugs were then placed through and above the fracked sands and a 7" cast iron solid bridge plug was set at 1,940' in the 7" casing just below the Murrysville injection zone. The injection string will be made up of 4 1/2" 10.5# J55 casing set on a Parmaco Standard Upside Down Pressure Packer at 1,796' See original well record and completion report, wellbore diagram showing the wellbore configuration, and the casing cement data chart at the end of this Attachment.

The annulus between the 4 1/2" injection string and the 7" casing will be filled with fresh water mixed with a small amount of corrosion inhibitor and bacteria growth preventer.

Logging Program:

The following open hole well logs were run: Gamma Ray, Compensated Density, Neutron, Dual Induction, Temperature and Caliper. The logs were run from TD to the bottom of the 7" with the Gamma Ray run to surface.

A cement bond log was run on the 7" casing showing a good cement bond to surface and is included with Attachment M.



Attachment G*
Geological Data On Injection and Confining Zones
SEDAT #3A Injection Well

Geological Data for Sedat #3A Injection Well

The Sedat #3 injection well will be a repurposed depleted natural gas well located in the Renton Gas Field in Plum Borough, Allegheny County, Pennsylvania. The injection well will target the Murrysville Sand as the injection zone which is water saturated and located very near the axis of the Duquesne-Fairmount syncline, see the copy of a section of Pittsburgh Region Structure Contour Map (Map 1) included with this attachment. Also included is a Geologic Map of the western part of Allegheny County, PA (Map 2). The immediate area around the well has been striped mined for coal (Pittsburgh Seam) and mined by underground methods for coal (Upper Freeport Seam); see the Area of Review map in Attachment B.

All six (6) wells within the ¼ mile Area of Review (ARO) penetrate the Murrysville sand, the state permit numbers for the wells are:

Permit #	Permit #	Permit #
003-21289	003-21210	003-22200
003-21223	003-21222	003-21644

All six wells were cased and cemented through the Murrysville, the well records can be found in Attachment B. The Sedat #1 permit # 003-21210 will be converted to an observation well by perforating the cemented casing string at the depth of the Murrysville.

The Murrysville Sand is approximately 128' thick, and lies at a depth of 1,822' to 1,950' in the Sedat #3 AOR. The well had an original TD of 4,309' and was plugged back to 1,940' to just below the injection zone. See Attachment M Construction Details for well schematic and cement data. Fluid will be injected into a 40' section of the Murrysville Sand through a 4" injection string set on a packer at approximately 1,800' in 7" casing perforated with 40 holes from 1896' to 1936'. The confining zones are the Riddlesburg Shale (Sunbury Equivalent) which overlays the Murrysville with the Riceville-Oswayo Shale lying underneath as the lower confining zone.

The upper confining zone lying directly on top of the Murrysville is the Riddlesburg Shale. The Riddlesburg is a dark gray to greenish and grayish black laminated shale and siltstone with occasional sandstone and limestone beds. The Riddlesburg is between 80 to 90 feet thick in the Sedat #3 AOR, see the Riddlesburg Isopach map, Map 3 at the end of Attachment G.

The Murrysville is a greenish-yellow to gray sandstone with occasional conglomeratic lenses, with high porosity and permeability. Because of the Murrysville's thickness, high porosity and permeability the formation serves as a gas storage reservoir to the south of

the Sedat. All most all the wells in the AOR including the Sedat #3 were drilled and cased through the Murrysville without running a porosity logs, see the well records in Attachment B. There are two wells for which porosity logs are available that show the average density porosity through the Murrysville Sand to average around 24%, which agrees with published reports of porosity values in the Murrysville. Refer to the log sections and location map at the end of this attachment for wells permit # 129-24721, and well permit #129-25581. Both wells where saturated with brine and did not produce gas.

Penneco conducted several tests to determine the reservoir characteristics of the Murrysville on its leases with the results included at the end of Attachment H. The test provided a breakdown pressure, the pressure needed to initiate a fracture, as 3,115 psi, ISP is estimated as 1,114 psi, with a fracture gradient of 1.23 psi. The reservoir pressure is 232 psi, with an estimated closure pressure of 553 psi.

Formation permeability for the Murrysville was reported by Melissa Sager (Petrologic Study of the Murrysville sandstone in SW PA, 2007) as generally high throughout the formation, with a range of 0.005 to 1,000 millidarcies with an average of around 100 millidarcies. The permeability of the Murrysville in the Sedat #3 is estimated to be 1.8 mD and was determined from a series of tests to determine the reservoir characteristics of the Murrysville sand on Penneco leases conducted by HFrac Consulting Services, LLC, see HFrac report at the end of this attachment. This value falls within the lower range of Sager's study.

The Riceville-Oswayo Shale lying directly beneath the Murrysville serves as the lower confining zone. The Riceville-Oswayo is about 30 feet thick in the AOR; see Map 4, Isopach map of the Oswayo Shale. The Riceville-Oswayo formation consists of dark gray to medium gray shale and siltstones.

Structurally the AOR has a series of northeast-southwest trending anticlines and synclines with the Sedat #3 well lying along the axis of the Duquesne-Fairmount syncline refer to Map 1. While there are some deep seated basement faults associated with the Rome Trough in the AOR there are no apparent faults at shallower depths.

37-003-21210

39' of 16" Casing
Sanded in with Cuttings

742' of 9 5/8" Casing
Cemented with 300 sks (Class A)

2,256' of 7" Casing
Cemented to surface with 551 sks (50/50 POZ)

Murrysville Sand

1,914'-2,024'

Perfs 2406-2421
Perfs 2468-2488

Fourth Sand
Fifth Sand

3,486' of 4 1/2" Casing
Cemented with 175 sks (Completion Blend)
Logged cement top at 1,740'

Perfs 3237-3243

Speechley
Stray

Perfs 3312-3352

Speechley

50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
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1050
1100
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2200
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2300
2350
2400
2450
2500
2550
2600
2650
2700
2750
2800
2850
2900
2950
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500

Monitoring connection to the Murrysville will be achieved by perforating the 4½" and 7" casings throughout the sand body after the lower formations have been plugged