



Robert Christian Reinhardt, PG

Geology • Hydrogeology • Environmental Science

Registered Hazardous Waste Site Manager

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May 18, 2021

Submitted via Electronic Mail to mjones@UltimateCommunities.com

Malcolm Jones, CEO
Ultimate Communities, LLC
150 Santiago Drive
Jupiter, FL 33458

Re: Brunswick County Sand Mine Development
Wellhead Protection/recharge and Reservoir Potential
NC Hwy 211, Southport, NC

Dear Mr. Jones:

Pursuant to your request, I have compiled the following information concerning the potential impact of sand mine development on your property (JHT Tract)(Figure 1 and Figure 2) on several Brunswick County water supply wells. I visited the site on April 23, 2021 to familiarize myself with the spatial relationship of the county wells to your proposed project and determine any impact from the existing sand pit on the property. I reviewed the Brunswick County Well Head Protection Plan and spoke with Mr. Glenn Walker, the Water Resources Manager for the County. In addition, I have reviewed the Well Records (GW-1 forms) for the County wells and the Sediment Boring Analysis reports prepared for you by Land Management Group (LMG). With this letter report, I am presenting my impressions and opinions concerning the site along with maps and photos in support.

Based on my reviews, there does appear to be the potential for an impact to one or more nearby county water supply wells due to the operation and expansion of the sand mine on the property. Based on the borehole logs and well records for the site, there does not appear to be a confining or restrictive layer of sediment between the surface sands and the shell beds/limestone (Castle Hayne Aquifer) in the area of the proposed sand mine. The Castle Hayne Aquifer comprises the county water supply zone. This conclusion is only applicable to the immediate area around the project site where subsurface information was available.

In addition to the logs and records reviewed, I observed water levels in the existing sand pit and on adjacent properties. Information provided to me indicates the total working depth of the existing sand pit was approximately 40 feet below land surface (BLS) and that the county well system has lowered the original potentiometric surface of the Castle Hayne aquifer by approximately 40 to 50 feet (personal communication – Glenn Walker). The water level in the sand pit was approximately 12 feet to 14 feet BLS indicating there may be a hydraulic connection between the bottom of the sand pit and the top of the aquifer the County draws from. The water level in a shallow pond (depth not known) on an adjacent property was approximately 3 feet to 4 feet below land surface (Figure 3).

Observation of the shallow sediments in the sidewall of the sand pit showed there does appear to be a layer of restrictive sediments within 5+/- feet of land surface but lower sediments appear to be unconsolidated, medium to fine grained sands. Borehole logs for soil borings done at the site indicate the fine to medium grained sands extend to approximately 40 feet BLS and grade into a slightly clayey fine to very fine sand with shell fragments to a depth of 58 feet. There does not appear to be sufficient silts or clays in this zone to form a confining or restrictive layer. At 58 feet BLS, the deep boring encountered the top of a dense weathered limestone which delineates the upper Castle Hayne Aquifer. This aquifer serves as part of the Brunswick County water supply.

Based on the County Well Head Protection Plan (WHPP), there are five (5) County water supply wells whose Well Head Protection Areas (WHPAs) overlap the site property boundaries. Water supply well #1 is actually located at the northeast corner of the property. Well #11 is located approximately 1,500 feet southwest of the property. Wells #12 and #12A are located 2,600 and 3,600 feet, respectively, from the northwest corner of the property. And well #15 lies approximately 5,000 feet north of the site (Figure 4).

In conversations with County officials, concerns were raised as to the possibility of adverse impact to the nearby wells resulting from the development of a larger sand mine on the property. The concern appears to have some validity based on the lowered water table in the existing pit and the borehole logs showing a lack of a restrictive aquitard between the surficial aquifer and the limestone aquifer. A review of the well record for Well #1 from the WHPP and a deep borehole log prepared by LMG indicates the immediate area around Well # 1 and the proposed sand mine is anomalous to the greater Wellhead Protection Area. Table 1 (below) summarizes the seven well records that were included in the WHPA and shows that there are significant confining layers in all but Well #1. The confining layers are characterized as dense gray to blue clay and range in thickness from 10 feet in Well #16 to 42 feet in Well #8. The thickness of these clay layers would be sufficient to restrict flow from the surficial aquifer to the

lower aquifer. Figure 5 shows the well locations relative to the subject property and gives an estimate of the limited extent of the area without a restrictive zone.

Table 1: Brunswick County Well Details

(From available NCDENR Form GW-1 - Well Records)

(wells listed are the only records available in the County WHPP)

Well #	Date Drilled	Well Daily Yield (GPD)	Well Total Depth	Borehole Total Depth	Confining Unit Depth	Confining Unit Thickness	Depth to Top of Aquifer	Screen Interval	Drilling Contractor
WSW-1	4/25/75	240,000	174'	264'	8' – 10'	2'	90'	90'-170'	Heater Well
WSW-8	6/5/75	950,000	160'	250'	4'-46'	42'	59'	65'-150'	Heater Well
WSW-12A	7/15/75	300,000	114'	120'	9'-20'	11'	57'	60'-110'	Heater Well
					30'-50'	20'			
WSW-15	7/3/75	570,000	129'	260'	37'-68'	31'	69'	75'-125'	Heater Well
WSW-16	5/2/81	730,000	155'	155'	30'-40'	10'	60'	63'-153'	Skippers Drilling
WSW-19	4/27/81	300,000	150'	150'	25'-40'	15'	62'	64'-144'	Skippers Drilling
WSW-6A	3/3/09	365,000	175'	198'	19'-30'	11'	75'	76'-96'	Skippers Drilling
					65'-73'	8'			

County officials have stated that they would consider granting approval for a larger pit if it could be shown that there was no adverse impact to the Castle Hayne Aquifer. Based on my recent observations and document review, it is apparent the existing sand pit already has a connection to the aquifer and there has been no mention that this connection has had any impact on the county wells. Given that the hydraulic connection already exists, I and my client would ask that the County consider another approach to resolving the permitting issue on the subject property.

The development of a sand mine on the JHT Tract may enhance the recharge of the county well field, resulting in reduced drawdown of the water levels and less stress on the Castle Hayne Aquifer. Prior to any permitting consideration, we propose a comprehensive groundwater sampling event of each county well and the surface water in the existing pit. Analysis parameters would include the full, State mandated drinking water list as well as any other metals, volatile and semi-volatile organic compounds, and inorganic compounds deemed necessary. If it can be shown that there is no significant difference or impact between the water bearing zones, then the recharge potential from a sand mine would benefit the County.

An additional benefit to developing the sand mine would accrue to the County when mining is completed at the site. There would be a large reservoir of surface water

available to the County for future water supply needs. The approximately 85 acre lake resulting from the sand mine operation could serve as a reservoir with more than 250 million gallons of surface water available for use. An additional incentive to such a reservoir is the proximity to a County water treatment facility located less than one mile from the JHT Tract and an existing pipeline from Well #1 (at the NE corner of the JHT Tract) to the treatment plant. This location would certainly make the reservoir utilization very cost effective.

The County may yet request some type of groundwater investigation to prove the connectivity of the surficial and Castle Hayne, but hopefully, the comparison of sampling results will show that relationship. I have spoken with Glenn Walker about the sampling and he is in agreement and said there would not be a problem providing a County employee to accompany the sampling event and provide access to the wells.

If the County still will not allow a sand mine to be permitted due to the proximity of the County wells, the option remains to abandon the existing wells and drill new wells farther away from the property. Please let me know if you have any questions. Thank you for allowing me to be of assistance to you.

Sincerely,

A handwritten signature in blue ink that reads "Chris Reinhardt". The signature is cursive and fluid.

Chris Reinhardt, PG, RSM
Geologist/Hydrogeologist

Attachments



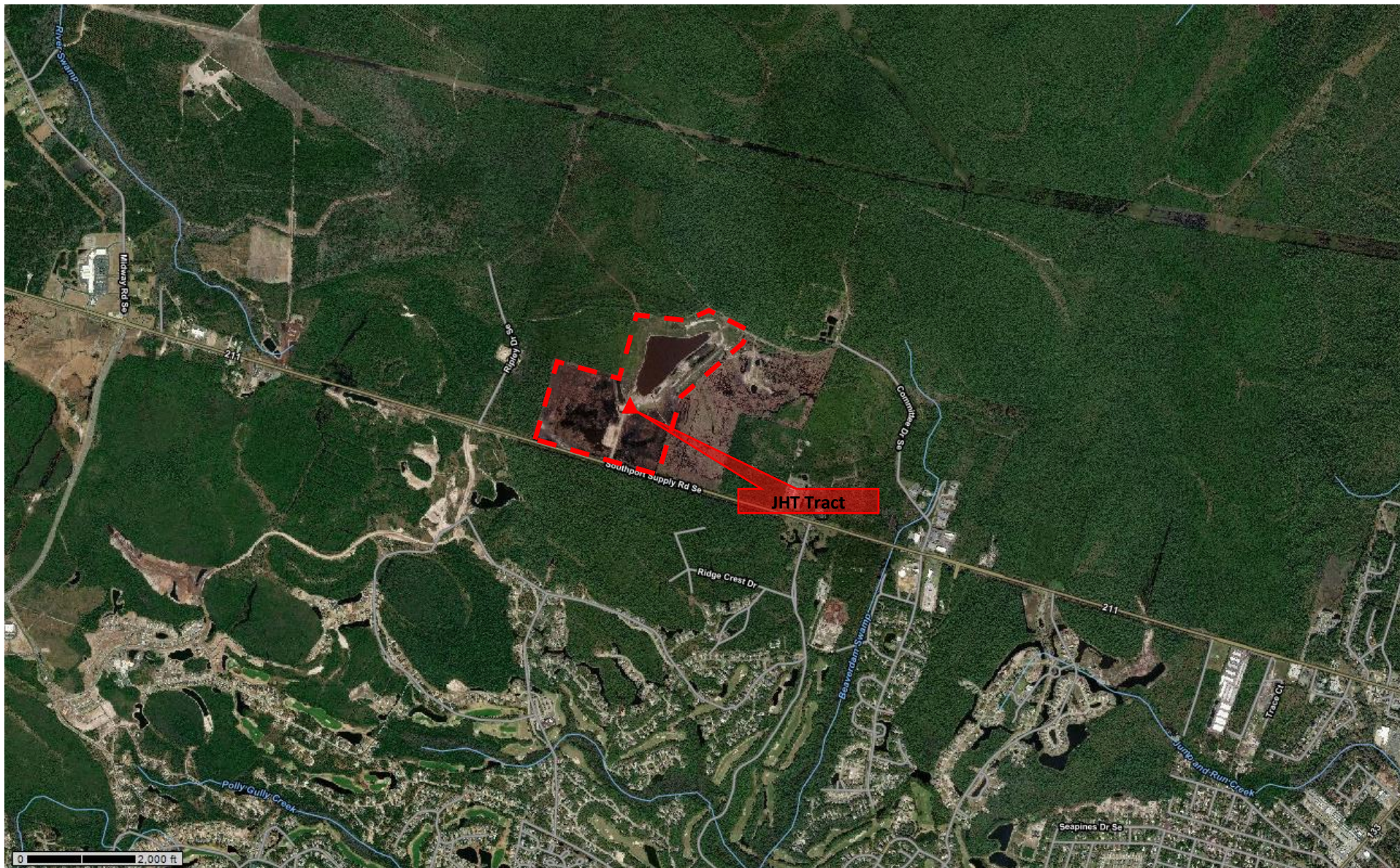
Southport, North Carolina
Jones Holding NC, L.L.C.



DRAWN	DATE
MS	12.19.19
CHECKED	SCALE
JEL	1"=200'0"

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**Site Location
Aerial Photograph
Brunswick County, NC**
(from NRCS-WebSoil Survey)

Latitude
33.96769°

Longitude
-78.09955°

Scale: As Shown

Drawn By:

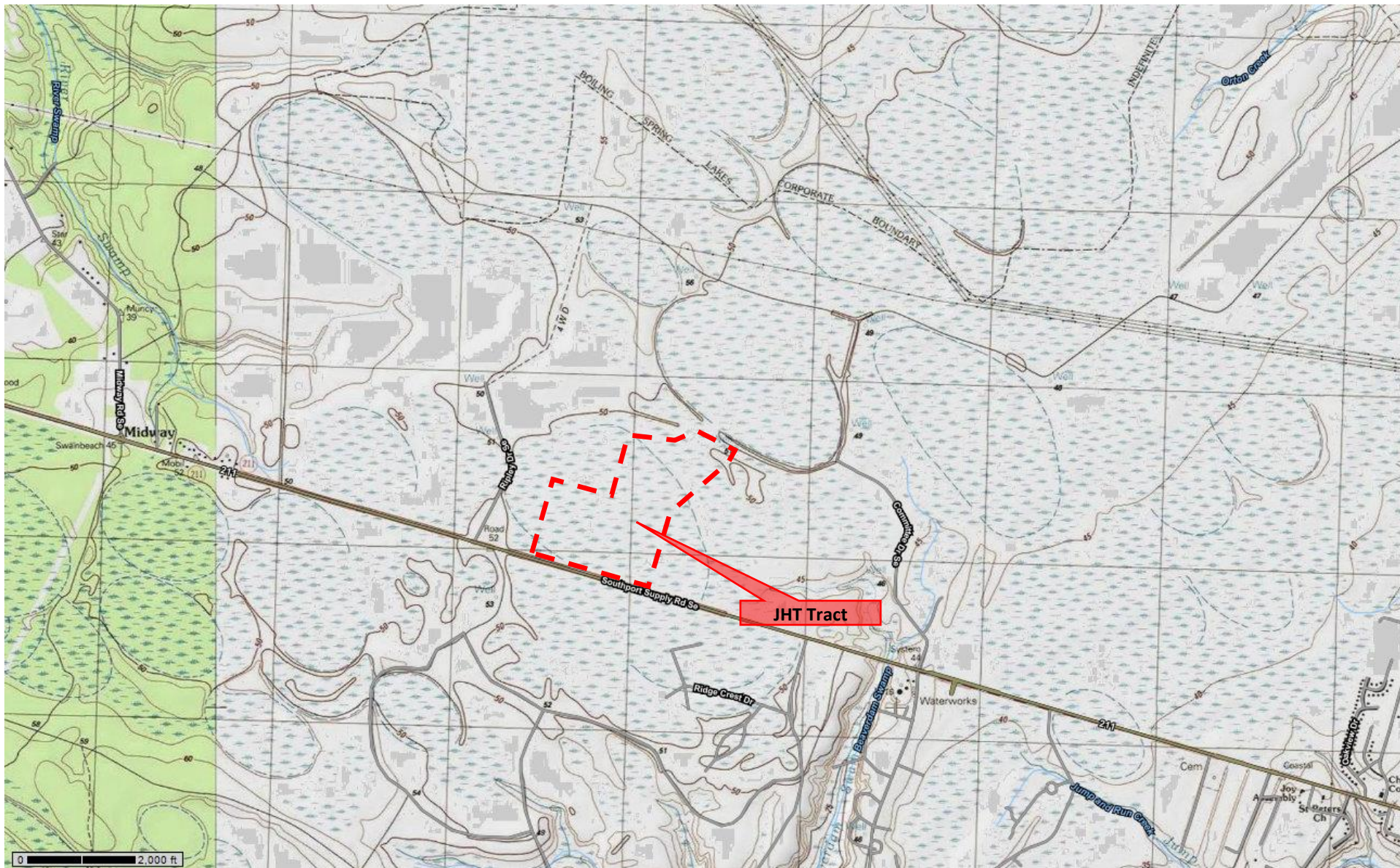
Photo Date: Sep 30, 2017

Project #: M-21-107

Figure 1

Final Drawing

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Settings\matt\My Documents\RCR
Files\Projects\148901



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**USGS Topographic Map
And JHT Tract Location
Brunswick County, NC**
(USGS Topographic Map from NRCS-WebSoil Survey)

Latitude
33.96769°

Longitude
-78.09955°

Scale: As Shown

Drawn By:

Date:

Project #: M-21-107

Figure 2

Final Drawing

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Settings\matt\My Documents\RCR
Files\Projects\148901

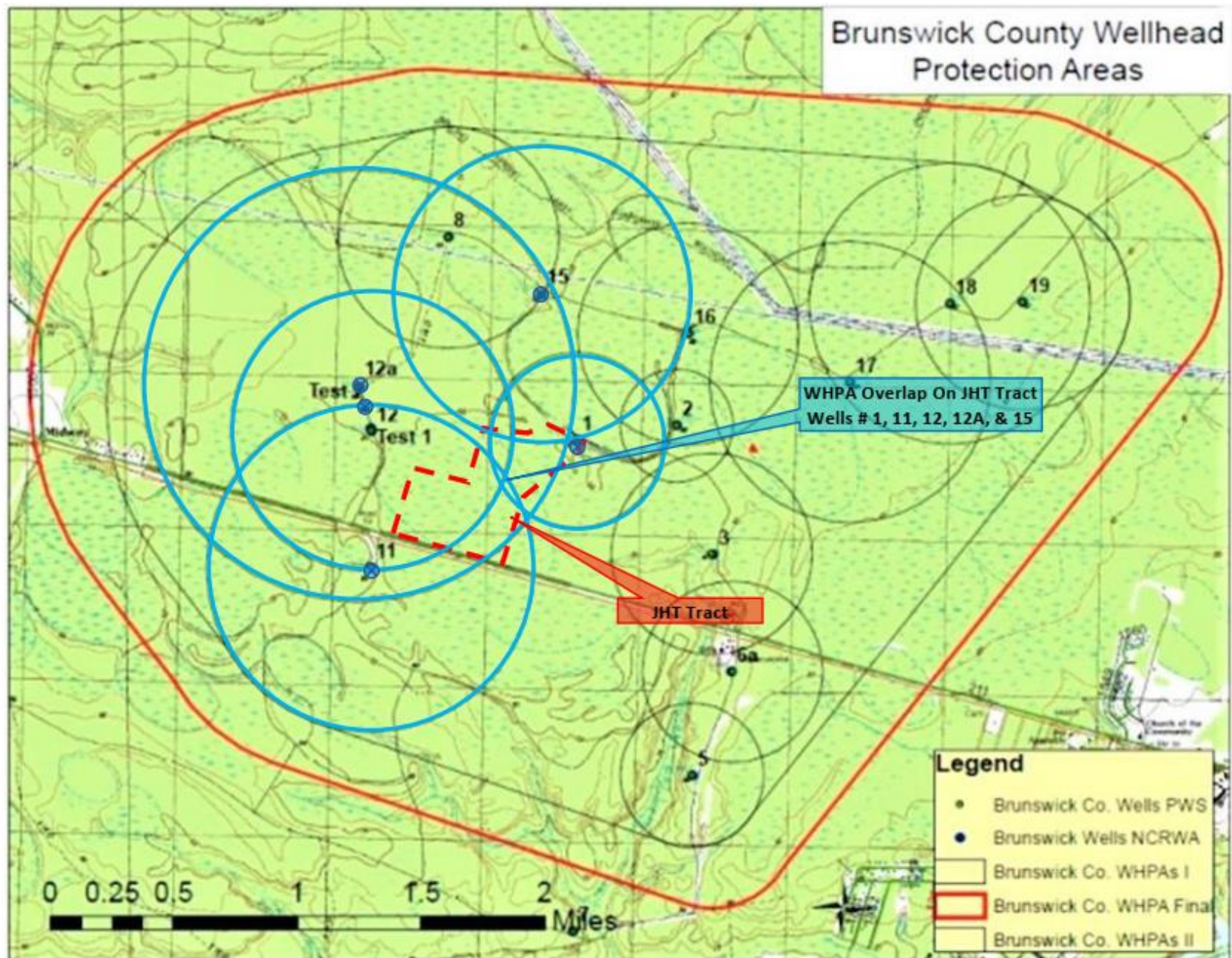


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Brunswick County GIS Aerial Photograph Parcel and Well Locations

(aerial photo courtesy of Brunswick County GIS)

Scale: No Scale	Figure 3
Drawn By:	
Date:	Final Drawing
Project #: M-21-107	



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**Brunswick County Water Supply
Well Locations
And Well Head Protection Areas**
(map from Brunswick County Wellhead Protection Plan)

Scale: As Shown

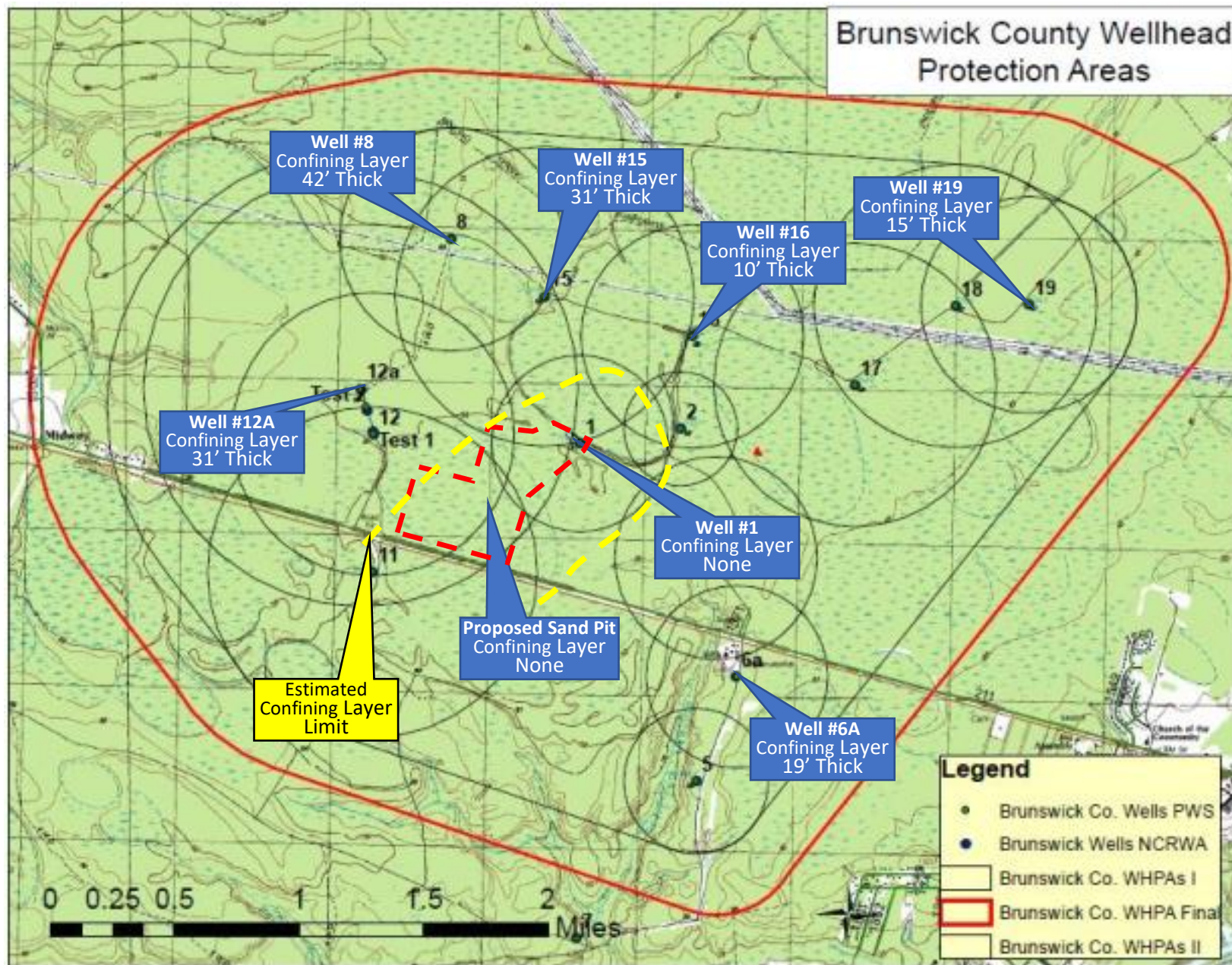
Drawn By:

Date:

Project #: M-21-107

Figure 4

Final Drawing



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Brunswick County Well Field Estimated Confining Layer Thickness At Select Wells

Latitude
33.96769°

Longitude
-78.09955°

Scale: As Shown

Drawn By:

Date:

Project #: M-21-107

Figure 5

Final Drawing

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Files\Projects\148901



**Existing Sand Pit on Subject Property
Water Level Approximately 12' to 14' below Land Surface**



**Existing Sand Pit on Subject Property
Water Level Approximately 12' to 14' below Land Surface**



**View of Shallow Restrictive Sediment Layer
From the Existing Sand Pit**



**Shallow Pond on Adjacent Property
Water Level Approximately 3' to 4' below Land Surface**



Brunswick County Well # 1