

Issue Analysis Form



Date: September 14, 2021

Item: Wastewater Solution for Southpoint Business Park and Future Growth of the County

Lead Department(s): Engineering & Utilities

Contact Person(s): Frank Haltom

Description and Current Status

The Board has previously received information to consider a solution to increase the wastewater capacity to serve the Southpoint Business Park and future growth of the County. Documents previously presented to the Board for information and consideration are attached hereto.

Each solution requires procurement of architectural and engineering services. Therefore, staff recommends authorizing staff to procure these design services for the preferred wastewater solution.

Government Path

- | | | |
|--|---|--|
| Does this require IDA action? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Does this require BZA action? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Does This require Planning Commission Action? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Does this require Board of Supervisors action? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Does this require a public hearing? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |

If so, before what date?

Board Action Requested: A resolution to authorize staff to procure architectural and engineering services for the preferred wastewater solution to serve the Southpoint Business Park and future growth of the county.

Fiscal Impact Statement

The Boards had previously designated \$2,500,000 of American Rescue Plan Act (ARPA) funds towards the design and permitting of the wastewater solution.

County Impact

A solution to increase wastewater capacity will allow the build out of the business park.

Notes

Attachments are included.

Board of Supervisors
County of Prince George, Virginia

Resolution

At a regular meeting of the Board of Supervisors of the County of Prince George held in the Boardroom, Third Floor, County Administration Building, 6602 Courts Drive, Prince George, Virginia, this 14th day of September 2021:

Present:

Floyd M. Brown, Jr., Chairman
Marlene J. Waymack, Vice-Chair
Alan R. Carmichael
Donald Hunter
T. J. Webb

Vote:

On motion of _____, seconded by _____, which carried _____, the following Resolution was adopted:

RESOLUTION: AUTHORIZATION TO PROCURE ARCHITECTURAL AND ENGINEERING SERVICES FOR A WASTEWATER SOLUTION (TREATMENT PLANT OR PUMP STATION AND FORCE MAIN) TO SERVE THE SOUTHPOINT BUSINESS PARK AND FUTURE GROWTH OF THE COUNTY.

WHEREAS, the Board desires to increase the wastewater capacity to serve the Southpoint Business Park and future growth of the County; and

WHEREAS, the Board has considered the options presented to provide the additional wastewater capacity; and

WHEREAS, the solution requires architectural and engineering services.

NOW, THEREFORE BE IT RESOLVED that the Board of Supervisors of the County of Prince George this 14th day of September 2021, hereby authorizes staff to procure architectural and engineering services for (i) a wastewater treatment plant or (ii) a pump station and force main to serve the Southpoint Business Park and future growth of the county.

A Copy Teste:

Percy C. Ashcraft
County Administrator

SOLUTIONS FOR FUTURE WASTEWATER CAPACITY



Board of Supervisors

August 10, 2021

PS LAYOUT

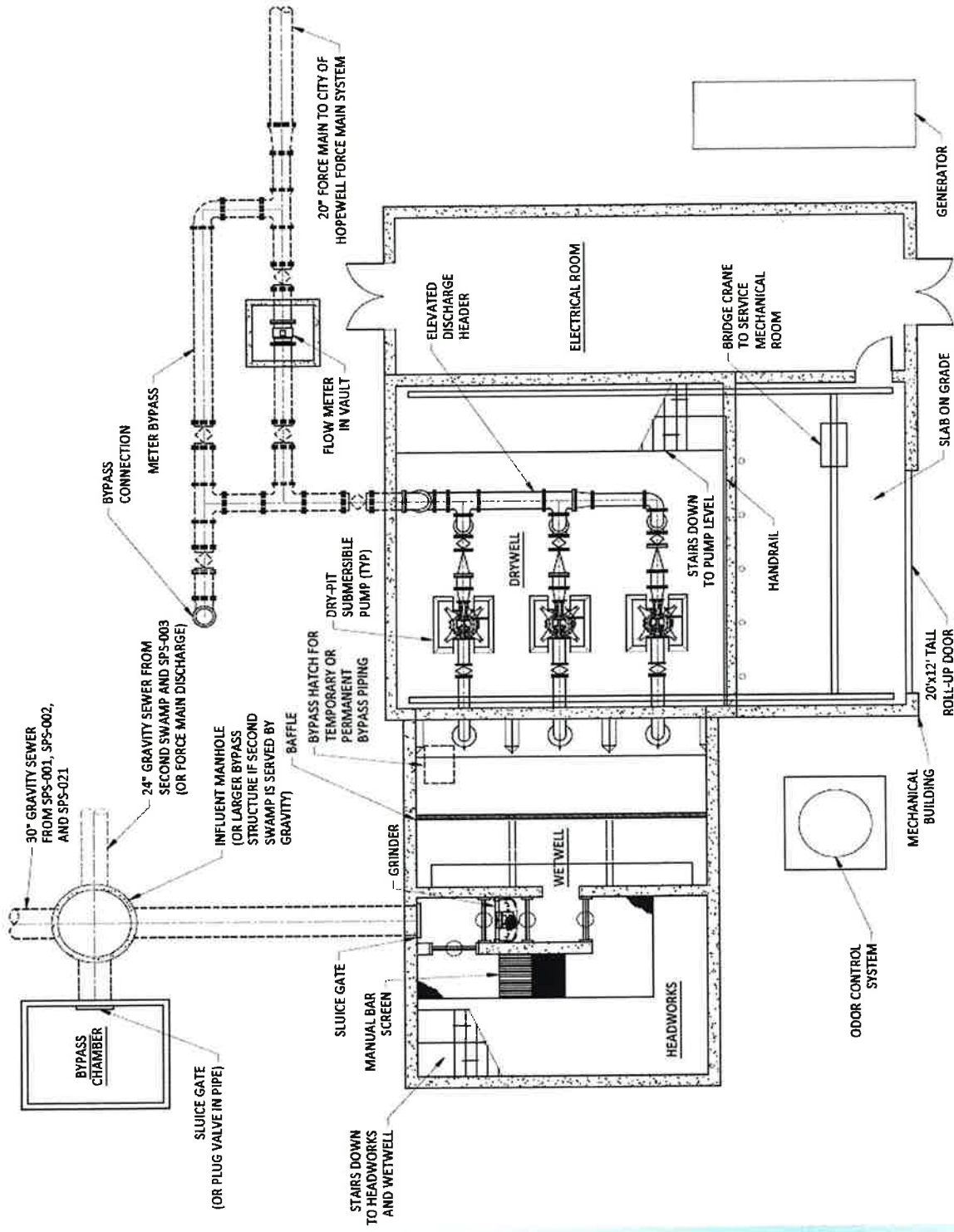
Hopewell Disposal

Strengths:

- Capital costs significantly less than WWTP.
- Does not require a licensed operator

Weaknesses:

- Significantly higher O&M cost – more than double.
- Increases flows to Chesapeake Bay watershed – could have future cost implications.



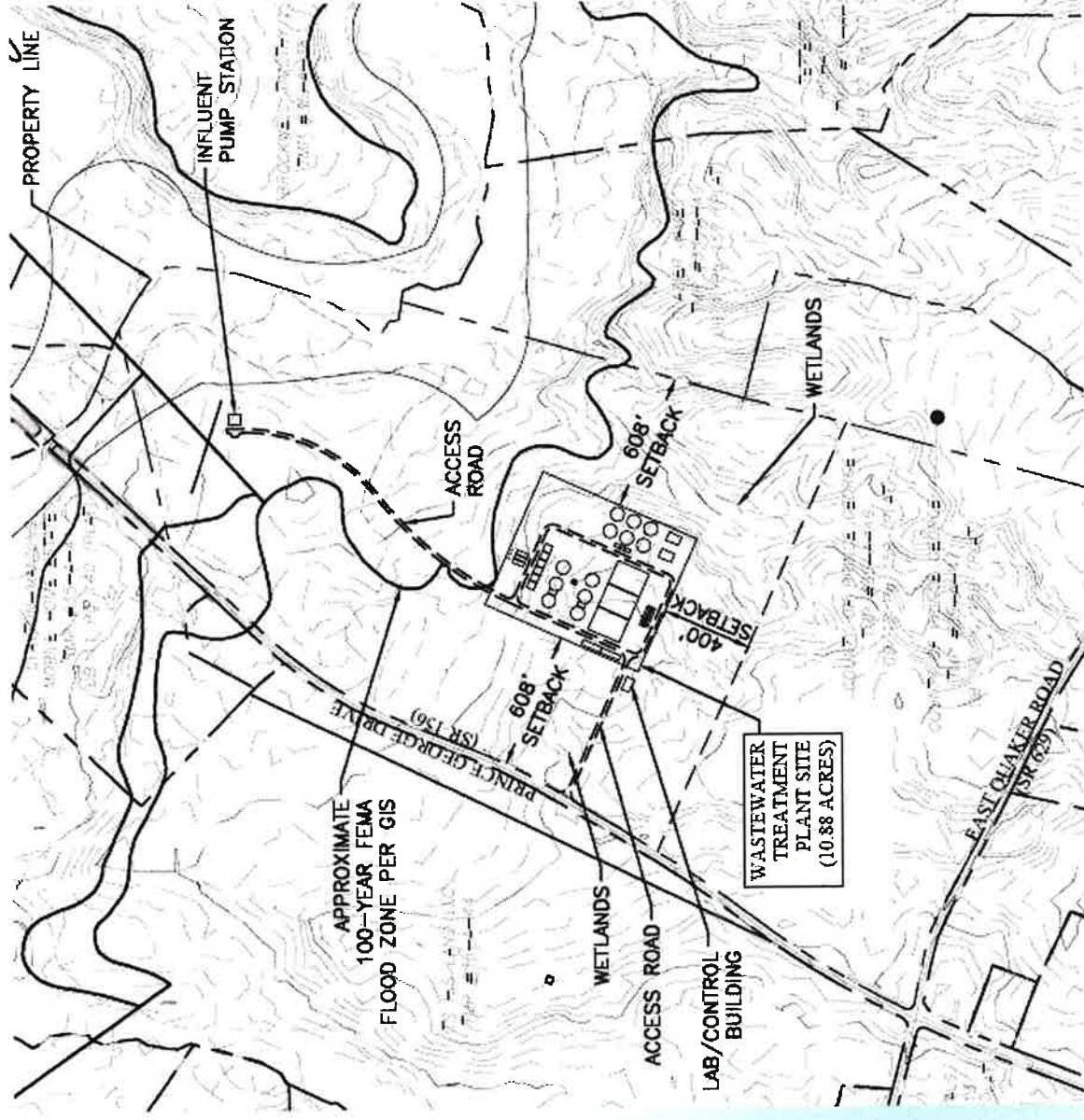
COUNTY-OWNED WWTP

Strengths:

- Significantly lower life cycle cost
- Will reduce flows to Chesapeake Bay watershed
- Potential to reroute existing flows from SCWWA & Hopewell to county-owned WWTP – reduces 3rd party fees
- Potential for reuse at business park as non-potable process water (reduced water demand)

Weaknesses:

- Ability to recruit employees with proper credentials to operate the plant



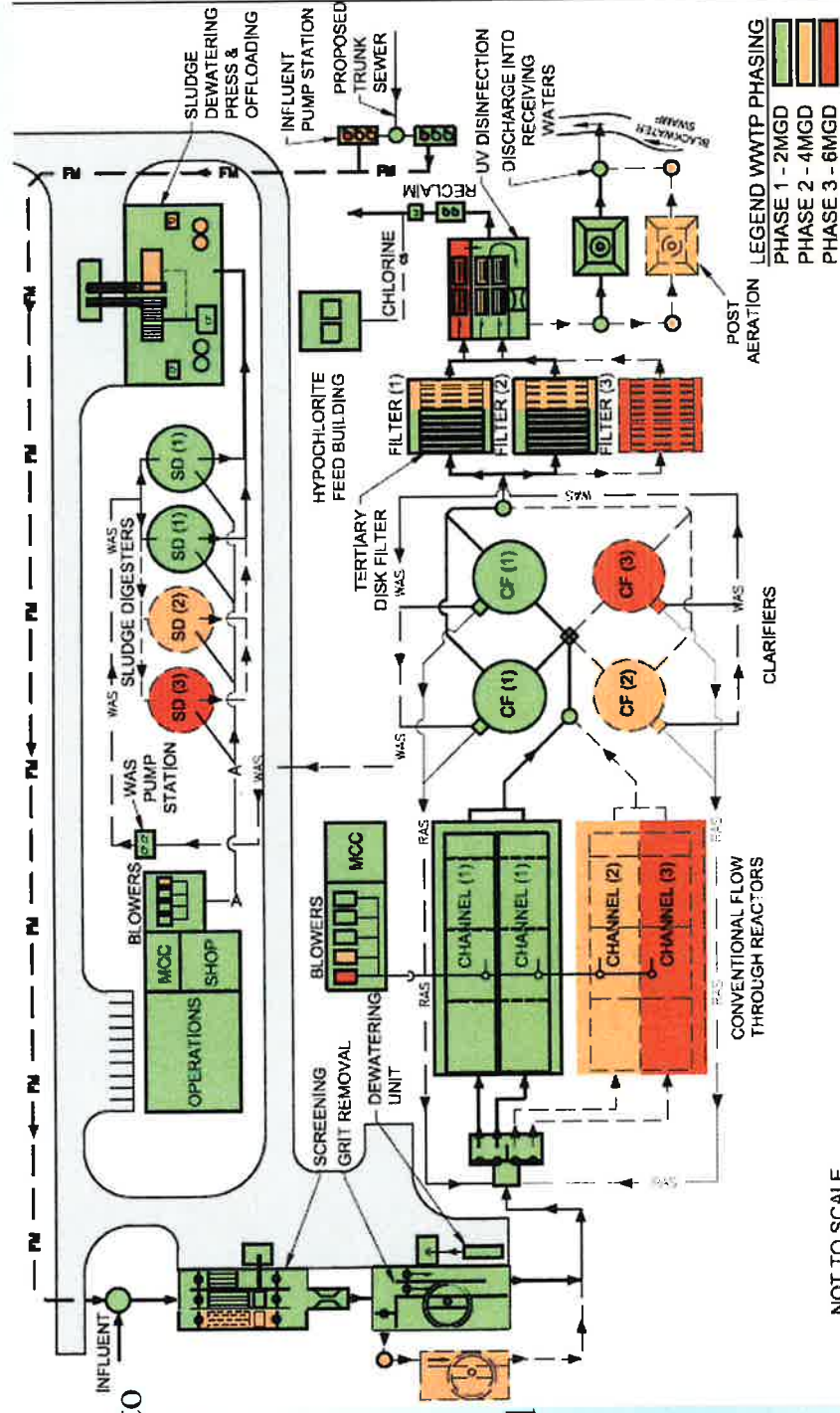
New Conventional Flow-Through System WWTP

Advantages:

- High energy efficiency.
- Capability to optimize treatment to achieve improved quality of final effluent.

Disadvantages:

- Greater mechanical complexity.
- Increased instrumentation needed to take full advantage of energy efficiency capabilities.
- Requires separate clarifiers and return sludge pumping.



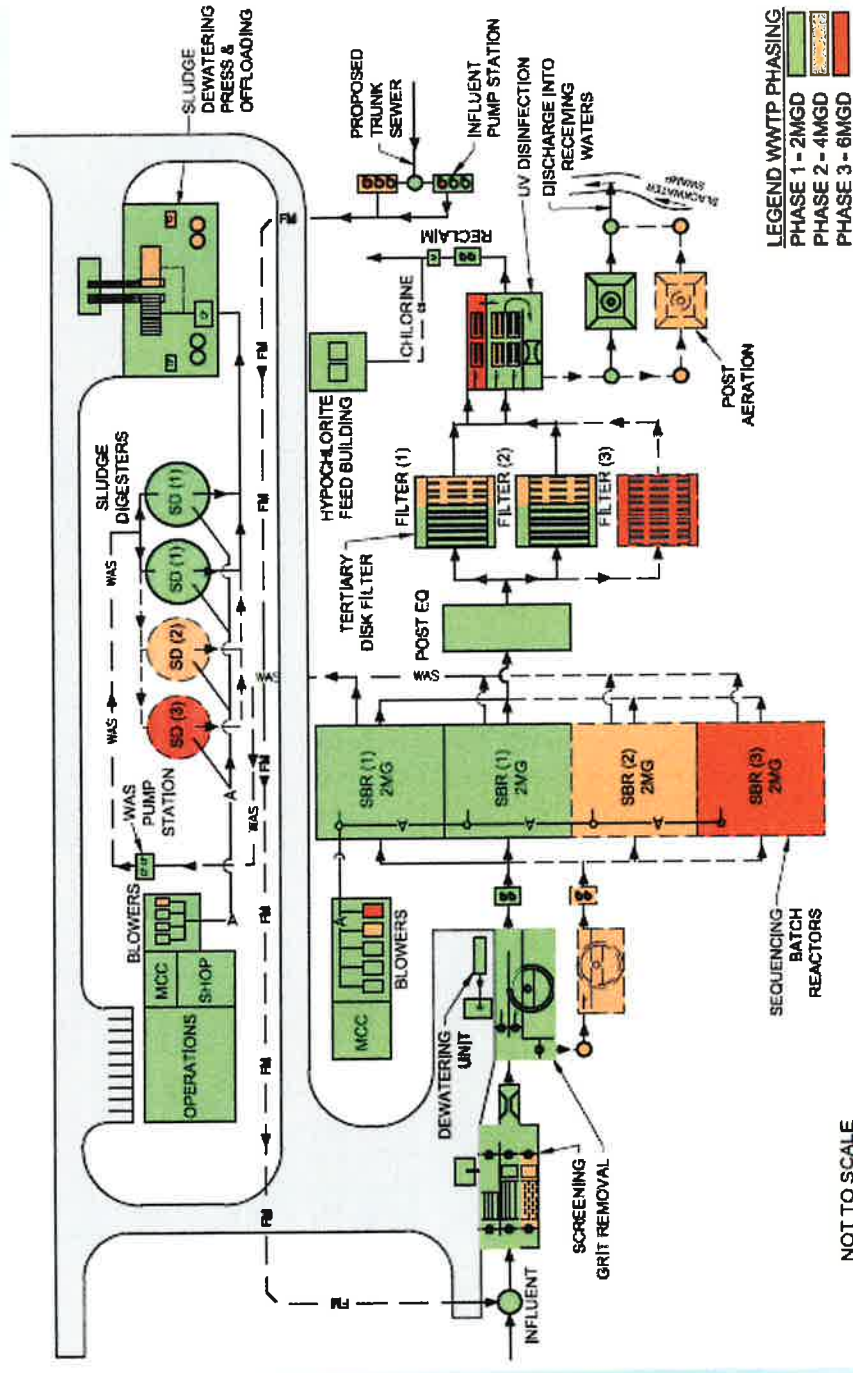
New SBR WWTP

Advantages:

- Eliminates separate clarifiers and return sludge pumping.
- High energy efficiency.
- Achieve high quality effluent under a large range of loading conditions.
- Can achieve higher levels of total nitrogen removal
- Smaller plant footprint

Disadvantages:

- Higher level of automation is required for timing of unit phasing and control settings
- Requires additional tank to achieve post equalization as this is a batch process



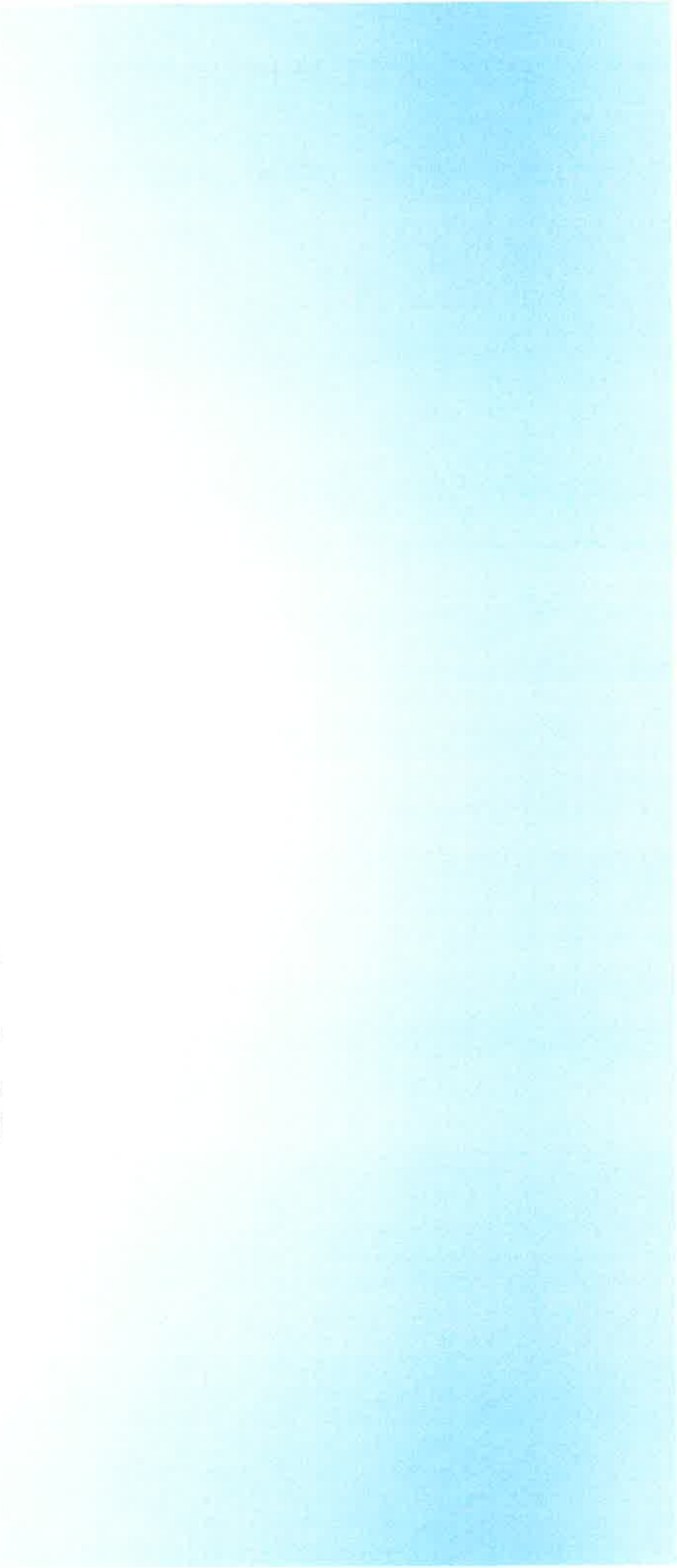
| | PS and FM to Hopewell | Conventional WWTP | SBR WWTP | Comments |
|--|-----------------------|--------------------|--------------------|--|
| Initial Capital Costs (up to 4 MGD) | \$17,710,000 | \$27,428,000 | \$32,470,000 | SBR plants can more easily contain odors versus the traditional continuous flow plants |
| Phase 2 Capital Costs (up to 6 MGD) | \$1,650,000 | \$12,500,000 | \$12,000,000 | Phase 2 costs of WWTPs not provided in PER. Values based on Southpoint Utility Study |
| Annual Operating Costs | \$2,243,357 | \$1,000,000 | \$1,000,000 | |
| 20-year Life-Cycle Costs | \$62,577,140 | \$47,428,000 | \$52,470,000 | Includes only initial capital investment plus annual cost for 20 years. |
| 20-year Life-Cycle Costs with Phase 2 | \$64,227,140 | \$59,928,000 | \$64,470,000 | Capital investment to achieve 6 MGD plus annual cost for 20 years. |
| Level Debt Service Amortization on Initial Capital Cost | \$823,740 | \$1,275,750 | \$1,510,267 | 30-yr term at 2.3% (initial capital costs) |
| Level Debt Service Amortization on Phase 2 Capital Cost | \$76,746 | \$581,409 | \$558,152 | 30-yr term at 2.3% (Phase 2 capital costs) |
| Cost of Project to Convey Sewer | \$7,558,800 | \$10,616,000 | \$10,616,000 | Trunk main to PS or WWTP if PS is located on Yancy property, costs will be the same as WWTP |
| Level Debt Service Amortization on Conveyance Sewer Cost | \$491,711 | \$690,586 | \$690,586 | 30-yr term at 5% |
| Total Annual Costs | \$3,558,808 | \$2,966,336 | \$3,200,853 | Initial capital only: Debt Service for selected option + Annual cost + Debt service for Conveyance sewer. This is not a present worth value. |
| Total Annual Costs with Phase 2 | \$3,635,554 | \$3,547,745 | \$3,759,005 | Initial + Phase 2: Debt Service for selected option + Annual cost + Debt service for Conveyance sewer. This is not a present worth value. |
| Requires Operator with License | No | Yes | Yes | A Class 2 licensed wastewater works operator for the 2-4 MGD facility; A Class 1 licensed wastewater works operator for the 4+ MGD facility. |
| Reduces flows to Chesapeake Bay Preservation Area (CBPA) | No | Yes | Yes | Reducing flows to CBPA may allow greater opportunity for grants. |
| Potential savings to redirect flows from SCWWA | | | | Initial savings of approx. \$150,000 annually to redirect flow from SCWWA to WWTP. Additional savings realized as Southpoint Business Park & surrounding area grows, and as more sewer projects are completed to reroute flows. Redirecting flows from SCWWA to Hopewell would be negligible or cost more as rates increase. |
| Allows for potential reuse of grey water | No | Yes | Yes | Discharge from WWTP can be used for manufacturing/process water. Potential revenue source |
| Permitting or Reporting Requirements | No | Yes | Yes | WWTP requires monthly reporting with 10-year Permit cycle |
| Time to Design, Permit and Construct | 4 years | 4 years | 4 years | Initial phase only |
| Ability to Control Odor Emissions | Yes | Yes | Yes | SBR WWTP & PS options have slightly more odor control measures than Conventional WWTP |

| Alternative Analysis | | | | |
|-----------------------------------|-----------------------|-------------------|----------|--|
| Criteria | PS and FM to Hopewell | Conventional WWTP | SBR WWTP | Comments |
| Lowest Capital Cost | x | | | |
| Lowest Annual O&M Cost | | x | x | Due to Hopewell fees |
| Least Environmental Impacts | | x | x | WWTP reduces flow to CBPA |
| Cost Savings by redirecting flows | | x | x | Both WWTP options, \$150,000 savings per year by redirecting flows from SCWWA |
| Least Odor Emissions | x | | x | SBR & PS options have slightly more odor control measures than Conventional WWTP |
| Best Potential for Grants | | x | x | Primarily due to ability to remove flow from CBPA |
| Long Term Feasibility | | x | x | Ability to control rates and add future flows |

Note:

The PER for the WWTP options recommends a conventional continuous flow bioreactor plant, which differs from the SBP utility study recommendation of a sequencing batch reactor plant. The difference in the estimated capital costs appears to be the primary reason for this recommendation.

QUESTIONS AND DISCUSSION





County of Prince George, Virginia

"A global community where families thrive and businesses prosper"

Memorandum

To: Percy Ashcraft, County Administrator

From: Frank Haltom, Director of Engineering & Utilities *F AH*

Date: August 4, 2021

Subject: **Wastewater Solution**

Mr. Ashcraft

This memo provides some additional insights and explanation of the options presented to provide additional wastewater capacity at Southpoint Business Park (SBP). The master plan identified deficiencies in the wastewater collection and disposal capacities that serve SBP. To date, there have been 3 reports provided that have offered potential solutions to address this deficiency, which are: the SBP Utility Study (Dewberry, 2018), a preliminary engineering report (PER) for a new pump station and force main that would convey wastewater to Hopewell's WWTP (Dewberry, 2021), and a PER for a new WWTP (WW Associates, 2021).

The SBP Utility Study evaluated options for providing an additional 2 million gallons per day (MGD) of wastewater capacity at the Park. Options evaluated included a pump station and force main to Hopewell or a new WWTP. The types of WWTPs evaluated include a traditional continuous flow bioreactor, a sequencing batch reactor, and an oxidation ditch. The study recommended a Sequencing Batch Reactor (SBR) Plant based on lowest life cycle cost and greater flexibility to operate at lower initial flow rates.

The PER to further evaluate the option of a new pump station and force main to Hopewell provided a conceptual design and layout of the facilities and an updated estimate of costs. This estimate resulted in significantly less capital costs than shown in the SBP Utility Study. The projected savings are due to a revised location of the pump station and a more direct route of the force main. This reduced the amount of underground infrastructure for this option. However, it places the pump station within SBP at the rear of the former Ace Hardware property, which may not be a desirable location. Placing the pump station back on the Yancey property will increase capital costs close to those identified in the SBP Utility study, a potential increase of \$6-8 million.

The PER provided by WW Associates provides an analysis of the same three WWTP options as the SBP utility study with a detailed layout and estimate of the recommended option. WW Associates recommends a traditional continuous flow bioreactor plant, which differs from the SBP utility study recommendation of a sequencing batch reactor plant. The difference in the estimated capital costs appears to be the primary reason for this recommendation.

Other Considerations

Potential cost savings - Cost to convey wastewater through Petersburg and for treatment at SCWWA are significantly less than the costs for treatment at Hopewell's WWTP. Therefore, diverting flows from SCWWA to Hopewell will increase current conveyance and treatments costs by more than 5 times for the equivalent flows. In comparison, diverting flows from SCWWA to a new PG WWTP eliminates these costs. Furthermore, future extensions of the sewer throughout the County will offer more opportunities for savings by diverting additional flows from SCWWA to a new PG WWTP. The initial flows diverted from SCWWA will save approximately \$150,000 per year (\$3M saving over 20 years). As improvements/extensions identified in the master plan are constructed, the savings could increase to approximately \$400,000 per year (\$8M over 20 years).

Environmental Impacts – Impacts on the environment are primarily the flow of treated wastewater from a treatment plant into a water source such as the James River, Appomattox River or Blackwater Swamp. The Hopewell and SCWWA plants discharge into the James River and Appomattox River, respectively. Ultimately, they both discharge into the Chesapeake Bay watershed, an economic resource under a watchful eye by regulators to ensure aquatic species of concern are not impacted. Costs to mitigate these impacts have proven costly and regulators continue to apply pressure to reduce and eliminate impacts. In comparison, the Blackwater Swamp discharges into the Blackwater/Chowan River watershed, where the same flows have less impact on the environment and thereby avoids significant mitigation costs.

Odor Emissions –There is a perception that pump stations will have less odor than a plant. Each option will have odor emission at some level. Every pump station will emit odors, which is evident at all other PG sewer stations. There are measures that can assist to reduce odors at pump stations. However, if the stations are located in an area with an adequate buffer to allow the odor to dissipate, these measures typically are not installed. WWTPs are very similar. With an adequate buffer and odor control measures, emissions can be maintained at similar levels. Wastewater at an SBR plant has less exposure to the atmosphere allowing better ability to control odor emission than the traditional plant. Odor control measures are included in the estimates provided for every potential solution. Site location of each option was also considered to provide the largest buffer to reduce the nuisance.

Thank you

Staff Questions and Responses

Q - How many current homes and businesses now on septic would be available to join the public utility system and abandon their septic systems? Which solution, plant or extension to Hopewell, would be better for this?

A - The initial project will allow only existing customers already served by the public utility system in the business park to be served by the new solution. Therefore, no existing homes and businesses will be able to connect to the new solution without further expansion of the gravity sewer to the locations of existing homes and businesses.

The new Utility Master Plan will determine where/when new infrastructure is constructed.

Both solutions will equally meet the needs of those that wish to connect to public sewer.

Staff Questions and Responses

Q - How many vacant parcels are there today that would be available for development – either residential or commercial – that would benefit from the expansion? Which solution, plant or extension to Hopewell, would be better for this?

A - Both solutions will equally meet the needs of vacant parcels. With the variable size in parcels, it would be difficult to determine how many would be available for development.

However, the county GIS identifies approximately 45 development sites in the immediate area of the business park and Route 460 that could connect with less than 4 miles of gravity sewer expansion. Many more development sites could be connected if additional gravity sewer is installed.

The new master plan will provide a layout for future gravity sewer to serve vacant parcels.

Staff Questions and Responses

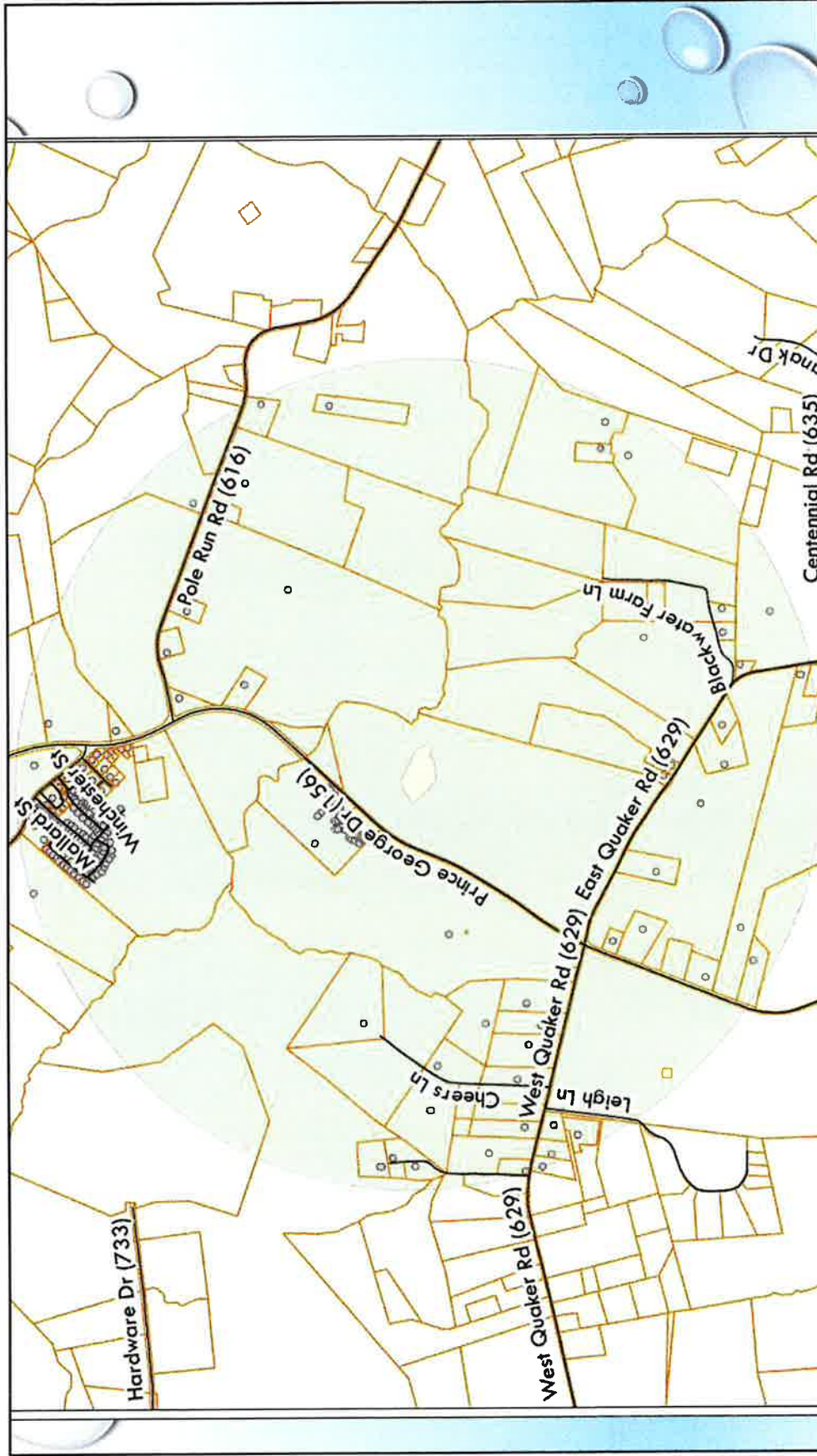
- **Q - Would the wastewater solution, either the plant or extension to Hopewell, shrink the current land zoning for agriculture and take it to residential or commercial zoning?**
- In general, installation of new public utilities will encourage new development. The additional wastewater capacity, provided by both solutions, will allow for new development to occur. However, any new development that requires rezoning from agriculture to residential or commercial must gain approval from the board.

Staff Questions and Responses

Q - How many houses are within one mile of the proposed sites for the wastewater plant or the pump station?

A – IT dept. has provided the number of properties that have addresses (assumes there is a home or business on the property). There are a total of 261 address points within a 1 mile radius. They are listed by zoning as:

- A-1: 1 home
- B-1: 2 homes
- R-A: 258 homes



Staff Questions and Responses

Q - Do wastewater plants typically raise, lower or leave the same the assessment value of surrounding properties?

A - Answer from the Assessor's office: the more developed the area, the more impact. The more rural, less impact. Also, how well the property is buffered would affect neighboring values. Values on approved building lots of the B-1 zoned properties will potentially see an increase in land value of approximately 15-30% based on the availability of public utilities, with approximately 15% allocated toward each utility, water and sewer respectively. Residential property values are virtually unaffected by the availability of public utilities versus private utilities. Residential properties that are affected by a wastewater facility in terms of sight, sound, or smell may see a decrease in value due to the external obsolesce of such plant. Similar external effects on residential properties within Prince George County have shown up to a 20% decrease in land value. The relative location of a dwelling would make that determination, not the specific boundary line of a property. Agricultural properties generally will see less of an impact than residential properties (i.e. A-1 vs R-A). The availability of public utilities will generally boost development. New parcels and new development will in turn increase the overall tax base.

Staff Questions and Responses

Q - What are the proposed dates for both options that would allow businesses and residents to tie in?

A - There are currently 2 pump stations in SBP that serve the wastewater needs. The initial project will allow only existing customers currently served by those 2 pump stations in the business park to be served by the new solution. Other projects not currently planned will need to be constructed to allow other businesses and residents to tie in. However, by diverting flow from these 2 pump stations to the new solution, it will free up the capacity of the existing sewer system along Bull Hill and Route 460, allowing new business and residents to connect.

Typically, it would take about 5 years to permit, plan and construct a plant. However, the permit of concern (VPDES permit to discharge into the swamp) has been obtained. Therefore, it is projected to take another 4 years to plan and construct. Likewise, it will take about 4 years to obtain easements, plan and construct a new PS and FM to Hopewell.

Staff Questions and Responses

Q - What has to be done at the Blackwater swamp if a plant is built?

A - Improvements to the swamp are not required for the extension to Hopewell. There was a question regarding impacts to adding 6 MGD of flow into the swamp. This flow represents less than 1% of the current flow into the swamp. The issuance of the VPDES permit by DEQ is the approval to allow the rate of discharge and the effluent limitations. Therefore, there are no improvements needed downstream to ensure conveyance of the flow from the plant; and the swamp is not impacted by the effluent.

Our consulting engineer has analyzed the impact of the plant discharge:

- The upstream drainage area to WWTP outfall is approximately 19.26 Sq.Mi. (12,326.35 acres).
- A 1-year, 24 hour storm will generate approximately 2,765 cubic feet per second (CFS) of flow at the outfall location. Plant design flow is 6 MGD = 9.28 CFS. Therefore, the plant design flow is approximately 0.34% of the 1-yr, 24hr storm to the outfall. The conclusion is that 6 MGD is a very small flow rate as it relates to the run of the river/swamp and will not create a flooding condition.

Staff Questions and Responses

Q - Will the construction of either option cause any traffic issues, either short term or long term?

A - During construction, both options will have impacts on the traffic for about 2 years. However, this is only to traverse to and from the site. All work will be performed on site with adequate construction entrances. For the extension to Hopewell, the route of the force main along the roadside will cause traffic delays during the work day. No long-term traffic issues will result from the construction of a new PS and FM. The WWTP will increase traffic but not significantly to cause traffic issues. When operating a 6 MGD plant, these include:

- Hauling of dried sludge from the plant to a landfill - 2-3 trucks per week.
- Chemical delivery - 2-3 trucks per week.
- Personnel - 3-5 vehicles daily.

| Matrix for Wastewater Solution Options | | | | |
|--|-----------------------|--------------------|--------------------|---|
| | PS and FM to Hopewell | Traditional WWTP | SBR WWTP | Comments |
| Initial Capital Costs (up to 4 MGD) | \$17,710,000 | \$27,428,000 | \$32,470,000 | SBR plants can more easily contain odors versus the traditional continuous flow plants |
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| Requires Operator with License | No | Yes | Yes | A Class 2 licensed wastewater works operator for the 2-4 MGD facility; |
| Reduces flows to Chesapeake Bay Preservation Area (CBPA) | No | Yes | Yes | A Class 1 licensed wastewater works operator for the 4+ MGD facility. |
| Potential savings to redirect flows from SCWWA | No | Yes | Yes | Reducing flows to CBPA may allow greater opportunity for grants. |
| Allows for potential reuse of grey water | No | Yes | Yes | Initial savings of approx. \$150,000 annually to redirect flow from SCWWA to WWTP. |
| Permitting or Reporting Requirements | No | Yes | Yes | Additional savings realized as Southpoint Business Park & surrounding area grows, and as more sewer projects are completed to reroute flows. Redirecting flows from SCWWA to Hopewell would be negligible or cost more as rates increase. |
| Time to Design, Permit and Construct | 4 years | 4 years | 4 years | Discharge from WWTP can be used for manufacturing/process water. Potential revenue source |
| Ability to Control Odor Emissions | Yes | Yes | Yes | WWTP requires monthly reporting with 10-year Permit cycle |
| | | | | Initial phase only |
| | | | | SBR WWTP & PS options have slightly more odor control measures than Traditional WWTP |
| Alternative Analysis | | | | |
| Criteria | PS & FM | Traditional WWTP | SBR WWTP | Comments |
| Lowest Capital Cost | x | | | Due to Hopewell fees |
| Lowest Annual O&M Cost | | x | x | WWTP reduces flow to CBPA |
| Least Environmental Impacts | | x | x | Both WWTP options, \$150,000 savings per year by redirecting flows from SCWWA |
| Cost Savings by redirecting flows | | x | x | SBR & PS options have slightly more odor control measures than Traditional WWTP |
| Least Odor Emissions | x | | | Primarily due to ability to remove flow from CBPA |
| Best Potential for Grants | | x | x | Ability to control rates and add future flows |
| Long Term Feasibility | | x | x | |