Village of Put-In-Bay

Regional Water Connection

vs

Village Water Treatment Plant

January 29, 2019

PDG Job #191100-00083

POGGEMEYER DESIGN GROUP
AN EMPLOYEE OWNED COMPANY

Celebrating 50 Years of Designing Solutions

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Purpose

The purpose of this report is to evaluate the best long-term solution for the public water supply needs of the Village of Put-In-Bay and South Bass Island.

The two primary alternatives are as follows:

1. Continue with the expanded Water Treatment Plant (WTP) including ozone, or
2. A regional water connection to the Ottawa County Regional Water System.

There are several variations of each option that could be considered:

Option 1a. Expand the existing WTP

Option 1b. Construct a new relocated WTP

Option 2a. Construct a single 8-inch to 12-inch service connection from the mainland to the Island:

A. To the existing ground-level water storage tank
B. To the existing elevated water tower
C. By-pass both tanks

Option 2b. Construct dual 8-inch or 12-inch service connections from the mainland to the Island:

A. To the existing ground-level water storage tank
B. To the existing elevated water tower
C. By-pass both tanks

History Summary

- The original WTP was a slow sand filtration process designed for 60,000 GPD with a peak flow of 140,000 GPD.

- In 1997 a WTP study was completed that considered the following options:

    - Membrane
    - Multi-Tech
    - Regional Connection
    - Wells
    - Slow Sand Filtration

- In 2000 – 2001, the WTP was converted to a Multi-Tech system with a 288,000 GPD @ 4 GPM/ft^2 rated capacity with one train on standby (ultimate capacity 360,00 GPD.)

- In 2002, a pilot study approved the rating to 6 GPM/ft^2 which increased the capacity. The raw water pumps were replaced and prefilters were added along with two new high service pumps (432,000 GPD with ultimate capacity of 540,000 GPD.)

- In 2003, a Regional South Bass Island Study was completed by the Ottawa County Commissioners.

- In 2005, a study was completed to address the contaminated well issue in the township that was discovered in August of 2004. This study suggested a rated capacity of 743,000 GPD to 866,830 GPD, including additional township service.

  The 2005 study evaluated seven (7) long-term options with associated peak flow capacity and costs:

Option	Peak Capacity	Opinion of Cost
Expand Existing WTP	.866 MGD	$5.2 M
Add Peaking Plant	1.789 MGD	$7.9 M
Expand Existing WTP & Add Peaking Plant	2.223 MGD	$8.6 M
Peaking only (existing equipment)	1.357 MGD	$7.2 M
Peaking only (new equipment)	1.357 MGD	$7.9 M
Regional Water Connection	2.000 MGD	$9.6 M
Dual Regional Water Connection	2.000 MGD	$11.6 M

None of these options considered ozone at that time. The new 500,000 gallon ground level storage tank and high service pumps were included.

Expanding the existing WTP was the selected option for long-term use.

- Only the ground level water tank and high service pumps along with raising the existing elevated water storage tank for improved township service was completed in 2007/2008.

- In 2010, a WTP study addressed new peak flows from the township and suggested increased demands to 0.730 MGD average and projected a 1.292 MGD peak.

  Alternatives considered were:

Option	Peak Capacity	Opinion of Cost
Expand Existing WTP	1.30 MGD	$1.826 M
New WTP @ New Site	1.41 MGD	$4.732 M
Regional Water Connection with the Ground Level Tank	2.00 MGD	$6.831 M

- In 2011 – 2012, a plant expansion was completed that included a new 12-inch raw water intake, a new raw water pump station with VFD's pumps, new Multi-Tech expansion, and transfer and backwash pumps with building enclosure for prefilters and raw water pumps (733 MGD without one (1) large Multi-Tech, 926 MGD without one (1) small Multi-Tech.)

- In 2014, the City of Toledo WTP experienced a microcystins level that suggested a No Drink Advisory. For three (3) days the area was without drinking water.

- In 2015, the Village proactively initiated a harmful algal blooms (HAB) WTP evaluation to insure its tourism economy was not impacted negatively by this potential issue.

- In 2016, the HAB Evaluation Study was completed. It included three (3) options:

    - Ozone treatment $1.178 M
    - GAC Media Replacement N/A
    - Regional Water Connection $7.350 M

  The evaluation concluded that Ozone treatment appeared to be the best alternative for implementation.

- In 2016, applications for funding was submitted to OPWC and DEFA and a 0% DEFA loan and a $250,000 OPWC grant was awarded.

- In 2017, a temporary Ozone System was installed and then repeated in 2018.

- In 2017, the Village requested an evaluation of a Regional Water Connection to be addressed in a more long-term perspective at the request of local resident Joe Cerny. This study was to evaluate this concept as it relates to volume and cost benefit to the existing WTP continued operation with Ozone treatment included. This study serves to address this issue.

- In May of 2018, the *Village Water System Analysis and Capital Improvement Plan (CIP)* modeling was completed to evaluate the Village's available fire flows and system growth capacity along with prioritizing distribution system capital improvements.

- In June of 2018, a HAB Study was completed as required by the Ohio EPA based on two raw water detects above 1.6 ug/l in a 12-month period (9/11/2017 and 9/18/2017.)

  This report was submitted June 11, 2018 to inform Ohio EPA that the Village had considered various alternative for treatment and was proceeding with implementation of Ozone treatment. The required Ohio EPA Asset Management Pan was initiated.

- During the year of 2018, the Ohio EPA and the Ohio Legislature were considering various funding programs to assist communities with HAB initiatives, regionalization and emergency interconnections. This was initiated by concerns for microcystin disruptions to water service,

One program that showed promise and initial interest was funding by the Ohio EPA that included to a 75% grant for regional connections where a WTP was being replaced as a result of a regional connection.

This funding opportunity would impact the results of this study and resulted in delays with its completion. An additional impact to the completion was the completion of the water system modeling report completed in May of 2018. The proper calibration of the model was significant and needed to be resolved to properly address service issues of a regional water connection.

At this point there is no reduced interest rate, 0% loan or grant funding that has been offered by any funding agency to assist with a regional connection. In 2019 and/or 2020, there may be new funding programs that could be created based on some suggested legislation. If this were to be considered, the Village of Put-In-Bay regional connection could certainly be a priority project. A new Governor expressed support for this legislation.

Technical Evaluation

- Ottawa County Catawba Island Elevated Storage Tank overflow elevation is 775 (82-84 psi). The normal operating range is elevation 760 (75.5 – 77.5 psi).

- The Put-In-Bay Elevated Storage Tank overflow elevation is 739.5 (60-64 psi). The base elevation is 592.5.

- Distance from Catawba Island to the South Bass Island connection point = 15,470± feet.

- Distance from the Catawba Island connection point to the Put-In-Bay Elevated Storage Tank = 26,840 feet.

- The following summary represents a 12-inch Pipe at various flows:

Gallons Delivered	PSI Loss to SBI	PSI Loss to Elev. Tank
250,000 GPD	.66	1.07
500,000 GPD	2.4	3.86
750,000 GPD	5.08	8.17
1.0 MGD	8.66	13.92
1.5 MGD	18.36	29.51
2.0 MGD	31.27	50.27

At a static (zero) flow, the pressures at the island and at the elevated tank could be 82 psi and therefore overflow the Put-In-Bay elevated tank as well as contribute to distribution system leaks. Since the existing water main from the connection point to the ground level storage tank is not a dedicated water main, pressures above 70 – 75 psi could be problematic for the existing pipe in the Village's distribution system. A pressure control valve would be required to reduce pressure to 60 to 65 psi which is typical on the island.

The location of the pressure reducing valve could be at the ground level tank or at the connection point to the island. The existing water main from the connection point to the ground level tank could be used for service and then pressure could be reduced at the ground level tank; however, all connections from the island connection point (near the Miller

Ferry) to the ground level tank would experience static pressure up to 82 psi and would likely require a pressure reducing valve on their service line.

If the pressure reducing valve is located at the connection point on the island, pressures would start at 60 to 65 psi and be reduced by 20 psi less at the ground level storage tank at peak flow. The ground level tank overflow is at elevation 620, so it fills with pressure more than 17-18 psi. A back pressure control valve will prevent the tank overflow and sustain system pressure at 35-40 psi.

Benefits/Concerns

Option 1a. Expand the Existing WTP

Benefits:

- Lowest Cost Alternative
- Supports original investment
- Potential to treat HAB

Concerns:

- Limited land availability
- High property values
- Limited access
- Limits to long-term production capacity
- Retaining certified operators

Option 1b. Construct a New Relocated WTP

Benefits:

- Future expandability
- Closer to ground level storage tank
- Noise reduction/new design
- More efficient functionality
- Improved automation

Concerns:

- Higher capital costs
- High land cost value
- Closer to businesses, noise and traffic
- Further distance from the raw water intake
- Retaining certified operators

Option 2a. Construct a single 8-inch to 12-inch service connection from the mainland to the Island, or

Option 2b. Construct dual 8-inch or 12-inch service connections from the mainland to the Island.

Benefits:

- Lower water rates (larger operations)
- Significant operational reliability
- No power outage issues
- More water volume for growth
- Economics of scale (reduced operating costs)
- Operational certification (larger facility, easier to attract talent)

- Minimizes operator certification issues on the Island
- Opportunity to sell valuable land
- Remove most neighbor conflicts
- No debt once paid

Concerns:

- Rechlorination
- TTHMs
- Water age
- Redundancy (single connection water main?) no fast repairs
- Pay for metered water losses
- Pay for unaccounted for water (fires, flushing, leaks, etc.)
- Still have Put-In-Bay facilities to operate and maintain:
    - Water tanks
    - Tank aeration
    - Pumps
    - Distribution lines
    - Water quality and testing
    - Valves
    - Hydrants
    - Services
    - Meters
    - Meter Reading
    - Billing/Administration
    - Continued debt payments
    - Potential recirculation pump (winter)
    - Ottawa County tap fees/charges
    - Potential two (2) pressure zone system (alternative to dedicated line to the ground level storage tank)
    - Underwater leak water contamination (Ottawa County to Put-In-Bay)
    - Protecting the water main under the lake

Regional Connection

The regional connection options have several unknown issues and several concerns:

- Will we be allowed to construct a single line versus dual lines?
- Is there any potential to serve Middle Bass in the future?
- The water main will be required to be protected in the lake bottom (excavated, bored, rock bulkhead.)
- The distance to the mainland is 15,470± feet and 26,840± feet to the Put-In-Bay elevated tank.
- The tank overflow on Catawba Island is 35 feet higher than the Put-In-Bay elevate water tank overflow elevation.
- The starting pressure at Catawba Island is 80 – 85 psi while pressures on the Island are typically below 60 psi.
- Selection of the best location of the pressure reducing valve both for system operation and for maintenance; Catawba Island, South Bass Island connection point or at the Put-In-Bay ground level storage tank. The ground level tank will require a control valve regardless, but a less complex valve.
- Selection of the water main size:
    - A 16-inch water main would be required to supply anything over 1.5 MGD.
    - At a 12-inch water main, a 1.5 MGD flow would have to enter the ground level tank and be repumped.
    - At 1.0 MGD the flows could fill the elevated tank without pumping.
- The line size has implications for fire flows:
    - 1,400 gpm (2 MGD) = 72 ft loss to the Island, 116 ft loss to the elevated tank.

- 1,050 gpm (1.5 MGD) = 42 ft loss to the Island, 68 ft loss to the elevated tank.
- 700 gpm (1.0 MGD) = 20 ft loss to the Island, 32 ft loss to the elevated tank.

- Fire flows are 750 gpm to 1,000 gpm in residential areas and 2,500 to 3,500 gpm in commercial/downtown areas. With the lake supply, this would not be totally dependent on the water system supply.

- With a 12-inch water main, the flows for a 3,000 gpm fire with storage and mainline service could be provided for approximately ¾ hour to one hour.

- With a 12-inch water main, the flows for a 1,500 gpm fire with storage and mainline service could be provided for approximately 1¾ hours, and 1,000 gpm fire for approximately 4 hours.

- There are ways to address these conditions with additional tanks and booster pumps near the Miller Ferry (the island connection point.)

- Larger diameter mains under the lake create more of a potential for water age and TTHM issues.

- To take advantage of the one-day storage of 700,000 gallons, the Village would need to maintain both tanks in operation. This would maximize fire flow and peak flow on days when the Ottawa County system may be experiencing peak flows concurrently.

Regional Water Rates

There are some variables that will have to be defined and negotiated before a regional connection's financial impact can be fully evaluated.

Based on Ottawa County's current rates, the largest meter rate is for a 6-inch meter, which requires a minimum of 334,028 gallon per month at $1,263.30 ($3.78/1000 gallons). The next 26,000 gallons is $3.63/1000 gallons and above 360,000 gallons per month = $3.27/1000 gallons.

Based on historical billed usage, two to four winter months would be less than 360,000/month billed usage. These months would be $3.50/1000 gallons average.

The Village would pay $3.27/1000 gallons for all leaks, water used for flushing, fires and maintenance along with any unmetered usage such as parks, etc. This will require the Village to be diligent in monitoring water losses and non-billed activities.

The County tap fee has the greatest potential to impact rates as the tap charge is $2,692/EDU (equivalent dwelling unit.) Using this application to the strictest extent would equate to a tap charge of $5,322,087 based on the current EDU count of 1977 x $2,692/EDU.

Since the Village is a public entity, there is not a past precedent for implementation of the Ottawa County tap fee for a wholesale purchase. It could be determined to be waived, fully implemented or potentially negotiated to a number in between.

Regional Operation Costs

The costs operate the regional system would continue to have the followings expenses:

- Distribution maintenance staff
- Bulk water purchase
- Billing and collections staff
- Distribution system maintenance (meters, hydrants, valves, service breaks, etc.)
- Elevated tank maintenance
- Ground level tank and pumping maintenance
- Electric costs for the ground-level pumping
- Service maintenance costs for breaks, connections and disconnections
- Meter reading
- EPA testing, lab, supplies etc.
- Administration for operations facility
- Vehicle maintenance
- Misc., telephone, insurance, uniform, etc.
- Debt for the regional connection
- Debt, billing and collection for tap fees
- Current debt for existing system improvements

Regional Connection Redundant Mains

The Ohio EPA has indicated a strong preference for redundancy if the Village opts for the regional service.

We would anticipate the two (2) mains being side by side under one rock bulkhead for protection from boat anchors and a partial trench on the lake bottom to control movement. The spacing would allow repair clamps to be installed.

While most of the two (2) main discussions to-date has focused on a single 12-inch or dual 12-inch water main, we have also considered the benefits of two (2) 8-inch water mains.

The 8-inch water main option would have some benefit. It would consist of a dual connection with the 12-inch on both Catawba Island and South Bass Island. The 8-inch lines could either operate singularly in low demand periods or together during peak demands. Each 8-inch line could deliver 1 MGD to the Island where, again, they would be connected to the single 12-inch water main feed to the Village.

Two (2) 8-inch water mains would allow more flow with less headloss than a single 12-inch water main. During the winter months, the County flow could be recirculated to improve water quality and the potential for TTHMs prior to the Island control valve. Additionally, having dual lines then could address emergency flows with one (1) line available and at least 1 MGD.

An Opinion of Probable Costs is included for both alternatives.

Annual Opinion of Probable Costs

Regional Alternative

Potentially the Ottawa County tap fee could be negotiated and is not included in these calculations:

O&M*:	$250,995/year
Debt (existing) =	$ 55,724/year
Ozone Debt =	$ 35,000/year
Cost of Water** =	$187,600/year
New Debt*** =	$283,600/year
Total Cost/Year =	$812,919 without Ottawa County tap fees

Current Ottawa County Tap fee $2,692/EDU x 1977 EDU (PIB) =$5,322,084 ($177,405/year @ 30 years with 0% interest)

*Distribution and administration typically 20% without booster pump station operations which would increase to 30%.

**56 MG @ $3.35/1000 gallons average = $187,600 (30% water losses)

***$7.351 Million = 2015 Costs @ 5%/year inflation average = 2018 Cost or $8.509 Million @ 0% interest for 30 years = $283,657/year (assumes HAB funding at 0%; however, we are not sure funding will be allocated at 0%. At 2%, the debt would be $372,475/year or a total of $83,258.) The worst case scenario would be $830,258 + $177,405 = $1,007,663/year (2019).

Water Treatment Plant Alternative

Using the 2017 – 2018 Village expenses which included ozone treatment in the summer season show be applicable to the new improvement; however, the reserve to replace the ozone equipment will need to be increased.

Current Expenses*

Existing O&M (including debt) =	$671,113/year
New Debt** =	$ 35,000/year
Repair/Replacement =	$ 40,000/year
Total Cost/Year =	$746,113/year (2019)

*Includes operating ozone 2017. Operation and debt expenses prior to 2017 and the ozone process averaged $585,000 with $638,000 being the highest.

**$1,254,000 Construction less $206,000 OPWC Grant = $1,048,000 @ 30 years = $34,933/year.

Breakdown of Expenses

Water Treatment Plant Alternative

Village of Put-In-Bay 2018 Actual Expenses		Village of Put-In-Bay 2019 - 2049 WTP Projected Expenses	
Expense	**Cost**	**Increase**	**Cost**
Wages	$224,939	3.0%	$545,986
PERS	$26,815	3.0%	$65,087
Medicare	$2,880	3.0%	$6,991
Health	$52,036	5.0%	$224,897
Life Insurance	$179	2.0%	$324
Workman's Comp	$2,387	2.0%	$4,324
Unemployment	$6,816	1.0%	$9,187
Travel	$563	2.0%	$1,020
Electric	$37,276	5.0%	$161,105
Telephone	$5,837	1.0%	$7,867
Training	$320	2.0%	$580
Property Insurance	$17,143	2.0%	$31,052
Trash	$684	3.0%	$1,660
Operating Supplies	$1,500	2.0%	$2,717
Chem/Op Supplies*	$271,014	3.0%	$378,078
Debt Principal	$45,357	Ex Debt Princ	$0
Debt Interest	$10,367	Ex Debt Int	$0
Reserves	$40,000	New Debt	$35,000
Total w/Ozone	$746,113	Sub-Total	$1,475,874
		Reserves	$40,000
Operation Balance	$495,370	Total Projected	$1,515,874
Impact Fees	$140,500		
Capital Recoup	$4,485		
OSU Recoup	$5,410		
MP Recoup	$1,700		
Total	$647,465		

*Some expenses are 1 time expenses or non-reoccurring expenses. This reduces the 30 year projection: $155,763 @3% = $378,078) including Ozone debt of $35,000 = $190,763

Regional Connection Alternative

Regional Connection Projected Expenses		Regional Connection 2019 - 2049 Regional Expenses		
Expense	Cost	Increase	Cost	
Wages	$135,000	3.0%	$327,680	
PERS	$15,500	3.0%	$37,623	
Medicare	$1,550	3.0%	$3,762	
Health	$34,700	5.0%	$149,971	
Life Insurance	$0	0.0%	$0	
Workman's Comp	$1,430	2.0%	$2,590	
Unemployment	$4,090	1.0%	$5,513	
Travel	$350	2.0%	$634	
Electric	$9,320	5.0%	$40,281	
Telephone	$2,920	1.0%	$3,936	
Training	$200	2.0%	$362	
Property Insurance	$4,285	2.0%	$7,762	
Trash	$0	0.0%	$0	
Operating Supplies	$1,000	2.0%	$1,811	
Chem/Op Supplies	$40,650	3.0%	$98,668	
Debt Principal	$45,357		$0	
Debt Interest	$10,367		$0	
New Debt*	$283,660		$0	
Bulk Water Cost	$187,600	1.5%	$293,234	
Ozone Debt	$35,000		$0	
Total Projected Cost	$812,979		$973,827	**
			$1,292,487	***

* Without Ottawa Co Tap Fee
** No New Debt Except Tank Maintenance & Pump Repairs
7 yr tank Maint w/Aeration & Mixing 5x over 30 years = 6 yr incr.
*** With Debt (New Only)

Basic 30-Year Comparison

Regional

$812,979	Projected 2019 Annual Expense without Ottawa County Tap Fee
$1,292,487	Projected 2048 Annual Expense without Ottawa County Tap Fee
$2,105,466	÷ 2 = $1,052,733/year
$1,052,733	x 30 years = $31,581,990
$1,052,733	+ $177,400 = $1,230,133
$1,230,133	x 30 = $36,903,990 With Ottawa County Tap Fee

Water Treatment Plant

$746,113	Projected 2019 Annual Expense
$1,515,875	Projected 2048 Annual Expense
$2,266,988	÷ 2 = $1,130,994/year
$1,130,994	x 30 years = $33,929,820

Present Worth

Regional Connection

Regional Connection:	$8.509 Million	
Salvage Value 30 years =	0.420 x $8.509 = $3,573,780	
$250,995 O&M	3%/year x 19.600 =	$4,919,502
$187,600 Bulk Water	1.5%/year x 24.016 =	$3,522,120
	TOTAL	$8,441,622

$ 8,509,000
$ 8,441,622
$16,950,622
$ 3,573,780
$13,376,842 x 0.05102 = $642,486 / year Present Worth

Add Ozone Debt & Other: $90,433 = $772,919 / year Present Worth

Water Treatment Plant

WTP with Ozone:	$1.254 Million
Salvage Value 30 Years =	$0.00

$1,254,000 Replacement Value

O&M includes $40,000/year for repair and replacement every 15 years.

$500,000 x 2.427 = $1,213,500 ÷ 30 years = $40,450

O&M $706,113 - $55,724 + $40,000 - $271,014 + $155,763 = $575,138

$575,138 x 19.6 =	$11,272,705
Replacement Value =	$ 1,254,000
	$12,526,704

$12,526,704 x 0.05102 = $639,112 ÷ $55,712 = $694,836/year Present Worth

Differences to Consider

Regional Connection vs WTP Operations

- A Regional Connection allows reduced manpower and operator certification.
- Improves success of attracting operator talent due to reduced certification requirements.
- The Village would be responsible for water losses, and maintenance water used in hydrant flushing, fire flows, street sweeping, tank cleaning, pool use if unmetered, etc.
- The Village would be dependent on Ottawa County rate increases/impacts.
- Ottawa County is a large system and has maintained reasonable water rates. Construction debt reduces in 2019 which would help stabilize water rates.
- Tap fees are enforced for all connections and would likely apply to the Village in some manner.
- Ottawa County has indicated that they have no interest in operating the system on South Bass Island which would involve the Village maintaining retail rates to its customers.
- Redundant mains would be recommended along with maintaining system storage for improved fire flow and emergency water supply due to potential interruption of services (700,000± gallons storage.)
- The Village would have the additional debt charge for any tap fees ($2,692/EDU (equivalent dwelling unit.) Using this application to the strictest extent would equate to a tap charge of $5,322,087 based on the current EDU count of 1977 x $2,692/EDU unless a lower cost can be negotiated with Ottawa County.) This equates to $7.50/month/EDU for 30-years without interest.
- Based on current information, included in the source water purchase costs would be an average of 30,000 to 40,000 gallons per day of uncounted for water ($115/day or $41,775/year.)
- The Regional Water would be safe and less likely to see HABs but could require rechlorination and tank aeration to control TTHM's.

- Water through the regional connection may need winter recirculation to minimize stagnation.

Fire Flows

The worst-case condition is for the Village to have a fire on a peak water use day. Fortunately, this would also be when the Lake is readily available to supplement the system depending on the location of the fire.

If we assume the peak day to be approximately 600,000 gpd or 417 gpm and if we add a 1,000 gpm fire flow, this would equate to 1,471 gpm or 2 MGD.

Under these flow conditions we can only support a pressure of 25 – 32 psi from Ottawa County depending on the water level in the elevated tank on Catawba Island. This suggests that we either construct a new booster pump station or we use the existing ground level tank and booster pumps. By using the existing ground level system, a dedicated fill line is required, or the Village would need to create a two (2) pressure system.

It appears that the Ottawa County connection could supply a total flow of 0.75 MGD to 1.0 MGD and still fill the elevated tank on the island. This is all subject to the Ottawa County System being at or near normal maximum operating levels.

Under these peak flow conditions, this only leaves 0.15 to 0.40 MGD for fire flow or 104 gpm to 277 gpm which is the demand available over and above what the Put-In-Bay 200,000 gallon elevated storage tank could provide, or the ground level and elevated tank at 700,000 gallons.

It seems prudent to use the existing ground level and elevated storage tanks in the summer peak with creation of two (2) pressure zones on the Island. It would be easier to operate the system by constructing a dedicated water main to fill the tanks, but it would be more expensive.

Operationally, the system works to satisfy the long-term demands of Put-In-Bay.

Other Considerations

- Potential to sell surplus equipment from WTP including Ozone.

- Sell property at WTP (maintain intake for future potential use.)

- An advantage to the Regional Connection alternative is that when debt is retired bulk water costs could remain stable at 1.5%/year average increases or less.
    - This assumes continued low water rate increases from the Ottawa County Regional operation which may not be true with future improvements (Ozone).

- The alternatives are more comparable over the 30-year debt amortization period without any consideration for Ottawa County tap fees.

- Regional costs for Put-In-Bay/South Bass Island could potentially be reduced if there was participation by Middle Bass Island, as an example.

- There is a higher salvage value on the Regional Connection alternative and lower deferred maintenance at the end of the 30-years.

- The WTP concept builds the reserve for Ozone repair and replacement to $1.2 Million over 30-years without interest earnings.

Summary

In the last twenty (20) plus years, the alternatives investigated have resulted in the existing WTP being the most cost effective solution for Put-In-Bay/South Bass Island.

What has changed is the regulatory mandates for treatment, operations, operator certification and required on-site supervision. This HAB is the latest requirement with other changes still being implemented.

The Regional Connection alternative has also become more advantageous with the water rates remaining stable due to growth, debt being reduced in 2019 with original note bonds retiring. New technology has impacted costs and the economic of scale are more obvious.

The impact/connection/tap fees remains an issue. The advantage would be more long-term than short-term due to the expense of the construction costs.

Since the land and equipment may be sold, this could offset new ozone debt.

The real benefit would result from an Ohio EPA or US EPA grant and low to 0% interest loan for regionalization and HAB funding.

The Village of Put-In-Bay and South Bass Island are in a catch 22 situation in that they cannot wait for regional connection funding and still protect the Island tourist economy form a HAB temporary water ban or restriction on use. The addition of Ozone on a temporary or permanent installation is a quicker, more reliable method of protecting the Island water supply in the interim.

If attractive funding option are developed for a regional connection this option can still be considered.

The Ottawa County Sanitary Engineer's office has indicated they have no desire to operate the Put-In-Bay water system, inside or outside of the corporation.

APPENDIX A – MAPS

REPLACE APPROX. 2,000 LF 8-INCH WL

12-INCH WL LAKE CROSSING

Color Coding Legend
Pipe: Diameter (in)

- <= 2.0
- <= 3.0
- <= 6.0
- <= 8.0
- <= 10.0
- <= 12.0
- <= 14.0
- <= 16.0
- <= 20.0
- <= 24.0
- Other

VILLAGE OF PUT-IN-BAY
REGIONAL WATER
OPTION 1: SINGLE 12-INCH WATER MAIN CONNECTION
EXHIBIT 1

REPLACE APPROX. 2,000 LF 8-INCH WL

DUAL 8-INCH WL LAKE CROSSING

Color Coding Legend
Pipe: Diameter (in)

- <= 2.0
- <= 3.0
- <= 6.0
- <= 8.0
- <= 10.0
- <= 12.0
- <= 14.0
- <= 16.0
- <= 20.0
- <= 24.0
- Other

VILLAGE OF PUT-IN-BAY
REGIONAL WATER
OPTION 2: DUAL 8-INCH
WATER MAIN CONNECTION
EXHIBIT 2

APPENDIX B - MODELING

Regional Water Interconnection Modeling Analysis

Modeled Service Areas:

1. South Bass Island water system,
2. City of Port Clinton distribution system, and
3. Ottawa County Regional Water transmission system with demands for the entire Ottawa County service area.

Pipes:

The following pipes were included in the model:

Table 1: Modeled Pipes

Dia (in)	Length (ft)		Dia (in)	Length (ft)
2	2,471		12	176,313
3	353		14	746
4	6,784		16	104,335
6	162,116		20	24,079
8	65,247		24	54,053
10	29,267		Total	625,764

Water Storage:

The model includes five (5) elevated storage tanks and one (1) ground level tank:

Table 2: Water Storage Tanks

Location	Owner	Ground Elevation	Overflow Elevation	Capacity (MG)
T1 Danbury Township	Ottawa Co	665	775	0.50
T2 Catawba Island	Ottawa Co	587	775	0.50
T3 Harris Township	Ottawa Co	599	775	0.50
PC–T1 Port Clinton	Port Clinton	578	724	0.75
T-SBI GL	Put-In-Bay	586	620	0.50
T-1 SBI	Put-In-Bay	593	740	0.10

Pumps:

The model includes three (3) High Service Pump at the Ottawa County Regional Water Treatment Plant and two (2) pumps at the Put-In-Bay ground level storage tank. The Put-In-Bay High Service Pumps are not active for this analysis. Table 3 shows the pump definitions used in the model:

Table 3: Pump Definitions						
	Ottawa Co HS (3)		PIB GL Pump 1		PIB GL Pump 2	
	Flow (gpm)	Head (ft)	Flow (gpm)	Head (ft)	Flow (gpm)	Head (ft)
Shutoff:	0	360	0	240	0	210
Design	5,000	250	500	200	100	208
Max Op	7,500	200	760	110	240	110

Demands:

Summer demands are included in the model for this analysis. Diurnal demand patterns were assigned to various junction nodes to better simulate the system under average day and peak conditions. Separate demand patterns are included in the model for commercial, commercial establishments on Put-In-Bay, mobile home parks, residential, schools and the hospital. The daily demand patterns all begin at 12:00 a.m. and include multipliers based on typical water use for each hour of the day.

Additionally, commercial establishments and residential users on South Bass Island have monthly multipliers which are as high as 9.288 in August and 9.1 in July based on the water usage information provided by the Village. Regional Water residential users have monthly multipliers as high as 2.624 in July and 2.678 in August. Setting demand patterns allow the model to simulate both average and peak conditions during the day.

Extended Period Simulation:

The Extended Period Simulation calculation option for each analysis starts on July 4, 2018 at 8:00 a.m. and includes a 48-hour duration.

The Ottawa County Regional Water Treatment Plant currently operates with a 9 MGD capacity. Based on the demand patterns included in the model, the highest demand in the analysis is 7,554 gpm which occurs for approximately one hour. The cumulative demand during the analysis was 6.098 MGD.

Fire Flow Analysis

The fire flow constraints in the model are set to 750 gpm flow needed with a lower limit of 20 psi.

Model Controls:

The model includes controls that allow the analysis to simulate the operations of the water system. Table 4 shows the controls included in the model:

Table 4: Model Controls

IF	THEN	ELSE
PC-T1 Hydraulic Grade <= 700 ft	PMP-1 Pump Status = On	
PC-T1 Hydraulic Grade <= 700 ft	PC-PRV4 Pressure Valve Status = Inactive	
PC-T1 Hydraulic Grade >= 724 ft	PC-PRV4 Pressure Valve Status = Closed	
PC-T1 Hydraulic Grade <= 700 ft	PC-PRV4 Pressure Valve Status = Inactive	
PC-T1 Hydraulic Grade >= 724 ft	PC-PRV4 Pressure Valve Status = Closed	
T-1 SBI Hydraulic Grade < 736 ft	PMP-SBI-2 Pump Status = On	PMP-SBI-2 Pump Status = Off
T-1 SBI Hydraulic Grade < 733 ft	PMP-SBI-1 Pump Status = On	PMP-SBI-1 Pump Status = Off
T3 Harris Tank Hydraulic Grade < 760 ft	PMP-1 Pump Status = On	PMP-1 Pump Status = Off
T3 Harris Tank Hydraulic Grade < 765 ft	PMP-2 Pump Status = On	
T3 Harris Tank Hydraulic Grade > 773 ft	PMP-2 Pump Status = Off	
T3 Harris Tank Hydraulic Grade < 768 ft	PMP-3 Pump Status = On	
T3 Harris Tank Hydraulic Grade > 775 ft	PMP-3 Pump Status = Off	
T1 Danbury Tank Hydraulic Grade < 760 ft	PMP-1 Pump Status = On	PMP-1 Pump Status = Off
T1 Danbury Tank Hydraulic Grade < 765 ft	PMP-2 Pump Status = On	
T1 Danbury Tank Hydraulic Grade > 773 ft	PMP-2 Pump Status = Off	
T1 Danbury Tank Hydraulic Grade < 768 ft	PMP-3 Pump Status = On	
T1 Danbury Tank Hydraulic Grade > 775 ft	PMP-3 Pump Status = Off	
T2 Catawba Isl Tank Hydraulic Grade < 760 ft	PMP-1 Pump Status = On	PMP-1 Pump Status = Off
T2 Catawba Isl Tank Hydraulic Grade < 765 ft	PMP-2 Pump Status = On	
T2 Catawba Isl Tank Hydraulic Grade > 773 ft	PMP-2 Pump Status = Off	
T2 Catawba Isl Tank Hydraulic Grade = 768 ft	PMP-3 Pump Status = On	
T2 Catawba Isl Tank Hydraulic Grade > 775 ft	PMP-3 Pump Status = Off	
OPTION 1: Single 12-inch Water Main Connection		
T-1 SBI Hydraulic Grade < 736 ft	FCV-1 = Inactive	FCV-1 = Closed
OPTION 2: Dual 8-inch Water Main Connection		
T-1 SBI Hydraulic Grade < 736 ft	FCV-2 = Inactive	FCV-2 = Closed

Modeling Analysis

Option 1:

Option 1 includes constructing approximately three (3) miles of 12-inch water main from the existing 12-inch water main on Catawba Island under Lake Erie to South Bass Island to a point on Langram Road south of South Passage Road. The connection point on South Bass Island is currently served with an 8-inch waterline. This section of existing 8-inch waterline that extends along Langram Road approximately 1,960 lineal feet, should be replaced with a 12-inch water

main. The pressure loss through the 12-inch water main from Catawba Island to South Bass Island is approximately 20 psi, but this will vary with the amount of flow - the greater the flow, the higher the friction loss (see the friction loss table in the Technical Evaluation section of this report.)

The high service pumps at the Put-In-Bay WTP are offline for all modeling analyses. The model analyzed the system with and without the existing ground level tank and pumps at the ground level tank.

Based on the modeling results, the existing elevated storage tank, ground level storage tank and the pumps at the ground level storage tanks would require to be maintained in service to provide adequate fire flows and pressures to the area. This is also recommended to maintain stored water in an emergency event if water could not be provided by Ottawa County or if the 12-inch water main under the lake was damaged or had to be isolated.

A fire flow analysis shows that the same areas fail the fire flow constraints as presented in the Put-In-Bay Water Distribution System Analysis and CIP dated May 14, 2018. A Regional Connection to the Island will not improve these areas without the Village being able to complete the items listed in the Capital Improvement Plan.

An extended period simulation shows that this option would require a flow control valve on the 12-inch water main connection to allow the Put-In-Bay water tower to cycle. Because of the Regional Water System operating pressure and the differences in elevation, without a flow control valve the Put-In-Bay water tower will hydraulically lock. The Catawba Island elevated water tower overflow is 35' higher than the Put-In-Bay elevated water tower overflow. This will create stagnant water in the tank. Controlling water to the island with a flow control valve will allow the Put-In-Bay elevated water tower to float on the system and help to maintain water quality. Adding aeration to the tanks on the Island is also recommended for water quality. The location of the flow control valve could be either on Catawba Island or at the connection point on South Bass Island. The location is dependent on if the Village or Ottawa County will be responsible for operation and maintenance rather than whether the location impacts service.

Option 2

The benefits of having the dual connection to the system are included in the Regional Connection Redundant Mains section of this report.

This option includes constructing two (2) 8-inch waterlines from Catawba Island extending under Lake Erie to South Bass Island to a point on Langram Road south of South Passage Road. The connection point on South Bass Island is currently served with an 8-inch waterline. This section of existing 8-inch waterline that extends along Langram Road approximately 1,960 lineal feet, should be replaced with a 12-inch water main.

Both 8-inch waterlines connect to the 12-inch water main on Catawba Island. The 12-inch water main is valved closed between the two (2) 8-inch connections. A flow control valve at the connection point on south Bass Island regulates the flow from the mainland based on the Put-In-Bay elevated water tower water elevations.

Based on the modeling results, the existing elevated storage tank, ground level storage tank and the pumps at the ground level storage tanks would require to be maintained in service to provide adequate fire flows and pressures to the area. This is also recommended to maintain stored water in an emergency event if water could not be provided by Ottawa County or had to be isolated.

A fire flow analysis shows that the same areas fail the fire flow constraints as presented in the Put-In-Bay Water Distribution System Analysis and CIP dated May 14, 2018. A Regional Connection to the Island will not improve these areas without the Village being able to complete the items listed in the Capital Improvement Plan.

An extended period simulation shows that this option would require a flow control valve on the 12-inch water main connection on South Bass Island to allow the Put-In-Bay water tower to cycle. Because of the Regional Water System operating pressure and the differences in elevation, without a flow control valve the Put-In-Bay water tower will hydraulically lock. The Catawba Island

elevated water tower overflow is 35' higher than the Put-In-Bay elevated water tower overflow. This will create stagnant water in the tank. Controlling water to the island with a flow control valve will allow the Put-In-Bay elevated water tower to float on the system and help to maintain water quality. Aeration/Mixing should be considered for both tanks. We did not perform a water age or constituent analysis for this effort.