

Agate Beach Water System Plan Part B

Executive Summary

This water system plan was written using the Washington State Department of Health (DOH) *Water System Planning Handbook*, April 1997. *Water System Plans (WSP)* are required for the following system categories per WAC 246-290-100 and WAC 246-291-140. *Water System Plans* are required to be updated at least every ten years or when proposed projects are not included in the current *WSP* and a State Environmental Policy Act review is required.

MCPUD1 owns and manages the Agate Beach Water System (#00510W) located approximately four miles from Shelton in Section 24, Township 20 North, Range 3 West, Willamette Meridian. This water system is one of 42 owned and managed by MCPUD1 throughout Mason County.

Mason County Public Utility District No. 1 (MCPUD1 or the District) is obligated to serve the approved 25 connections and has a duty to serve the 60 developable lots with water from the Agate Beach Water System. Without maintenance or improvements to the water system and expansion of the water right certificate, Agate Beach will not be able to provide future connections.

INTRODUCTION

The Agate Beach Water System was constructed in 1976 as part of the Plat of Agate Beach Estates and is a community Group A system. The system was constructed in several phases with the initial goal to serve up to 69 lots within Divisions 1, 2 and 3 of the plat; there are currently 60 lots after several have been combined.

This plan provides basic information about the water system per WAC 246-290-100, WAC 246-293-250 and WAC 246-295. The following topics will be covered in the discussion:

- A. Ownership and Management
- B. System Background
- C. Inventory of Existing Facilities
- D. Related Plans
- E. Existing Service Area Characteristics
- F. Future Service Area
- G. Service Area Agreements
- H. Service Area Policies
- I. Satellite Management Agencies
- J. Conditions of Service
- K. Complaints

The system is approved for 25 connections. According to the WFI and the *connected customer* list provided by MCPUD1, there are currently 23 active residential connections. Of these connections, 10 are permanent full-time residential connections, 13 part time residential connections. All services are currently metered. The system is currently approved for 25 connections.

SERVICE AREA

The existing retail service area for the Agate Beach Water System as described in the water right includes the entirety of Agate Beach Estates. Currently only 25 connections are approved. The *Mason County Comprehensive Plan* classifies this area as Rural Residential 5 which means residential parcels must be at least five acres. Service area, retail service area and place of use is shown below.



MASON PUD NO. 1 21971 N. US HIGHWAY 101 SHELTON, WA 98584						AGATE BEACH WSP SERVICE AREA		
REV	DATE	REVISION DESCRIPTION	DESIGNER	REVIEWER	CONTRACT NO:	BKI PROJECT NO: MA17-012		
					 BKI BROWN & KY SAR, INC.	0 REVISION	1 / 1	
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EXISTING SYSTEM DEMAND

Historic source meter data is available beginning in 2012. Service meters were installed beginning in 2012, the system wasn't fully metered until May of 2012. For this WSP, recorded meter data from 2013 through 2017 will be used. According to 2013 through 2017 records, Average Daily Demand (ADD) for the Agate Beach Water System is 240 gpd/ERU (Equivalent Residential Unit) based on source production. Maximum month average daily demand (MMADD) per household, based on 2013 through 2017 consumption data, is **165** gpd/ERU,

The current Peak Hourly Demand (PHD) is **76.50** gpm and is **beyond** the instantaneous water rights of 63 GPM. This is due to the high level of Distribution System Loss (DSL) the system is experiencing. The Agate Beach Water System has been experiencing high levels of DSL (approximately 66%) for a number of years. Consequently, the projections for future water demand and capacity are very conservative, as the analysis is based on existing conditions. It is expected that the District will locate and repair the source of leakage. Therefore, the long-range projections may not reflect the system once DSL has been reduced to the 10% state standard.

PROJECTED SYSTEM DEMAND

Based on the 20-year water demand forecasts, water rights will not be required if storage is provided to meet the peak hour demand. Water rights are discussed in Chapter 4 of this document. Additional connections are requested to serve 37 connections (37 ERU) with the current distribution system.

Major system improvements including a reservoir and booster station are required in order to serve additional connections beyond the 37 requested. System deficiencies and proposed solutions are discussed in Chapters 3 and 8.

TREATMENT

There is no permanent treatment for the Agate Beach Water System. A temporary chlorination system that uses direct injection of sodium hypochloride at the source is available for use when there is a positive result from the coliform testing.

The system is currently not treated and does not require treatment. Treatment is not expected in the next twenty years. Water quality analysis of the water from well 2 shows that water treatment is not required at this time to remain in compliance with the provisions of the Federal Safe Drinking Water Act. It is unlikely that treatment to improve water quality will be required in the 10-year or the 20-year planning periods. A summary of the water testing results are located in Appendix D.

WATER SYSTEM EFFICIENCY USE PROGRAM

The District Board adopted water use efficiency goals and measures for the Agate Beach Water System on August 12, 2014. Objectives of the District's conservation plan are to have distribution system leakage meet the 10% state standard. Distribution system leakage (DSL) will be determined three years after the system is fully metered.

Goals for the Agate Beach Water System are:

1. Implement metered billing rates three months after the system is fully metered
2. Reduce peak month production by 1% per ERU by 2015
3. Reduce total annual water production by 1% in 6 years

These goals are currently not being met because of the high DSL in the aging system (approximately 66%). Approval of this plan will implement an water loss action plan for the system.

SOURCE PROTECTION

MCPUD1 has developed Sanitary Control Areas and protective covenants for each water source which are on file with the Mason County Environmental Health Department. Protective well radii are a minimum 100 feet, unless a variance has been granted for a smaller radius. The protective covenants do not allow for any source contamination (livestock, hazardous material storage) within the 100-foot radius. The wellhead protection radius for the Agate Beach Water System was established using the Calculated Fixed Radius method as allowed by DOH. MCPUD1 developed the *Wellhead Protection Program* by coordinating with local and state agencies as part of its water system management for forty-four water systems within Mason County. The *Wellhead Protection Plan* is also part of *the Water System Plan Part A* for MCPUD1. The District distributes wellhead protection information to system users to educate them. When warranted, additional information is provided to property owners and occupants adjacent to or may have a direct impact on the wellhead protection area and watershed control area. A "Well Head Protection Notice" is sent to property owners within the 10-year zones of contribution. An example of the letter can be found in Appendix D.

OPERATIONS AND MAINTENANCE PLAN

MCPUD1 provides day-to-day operations with water department staff performing all routine operational procedures for the water system overseen by the Director of Operations. Water staff also coordinates preventative maintenance of the water system. The Director of Operations - Oversees all engineering design, construction contract management and water supply operations for PUD No.1. Oversees all construction, coordinates all field maintenance and metering reading operations; oversees engineering designs and standards; reviews plans, water system compliance and construction management. The Director of Operations - Relies on consulting civil engineers, that are licensed in the State of Washington to help in this endeavor. The plan also includes water quality control, emergency response, cross-connection control, implementation of the improvement program, budget formation, complaint response, public and press contact and billing.

SYSTEM PROPOSED IMPROVEMENTS

In order to serve 66 ERU (60 connections), a 20-foot diameter by 22 feet tall reservoir would have to be constructed and provide 51,672 gallons of storage. The proposed improvements would require an 8-inch PVC transmission main from the well to the reservoir to the distribution system and a 6-inch PVC main loop. The capacity analysis of the system at full build out shows that it has 61 ERU's. In order to serve 66 ERU or 60 connections, the 2-inch and 3-inch distribution mains would need to be replaced with 6-inch mains to increase the capacity of the piping system. Without the main replacement, the system will be limited to 61 ERU or 55 full time connections.

IMPROVEMENT PROGRAM

Based on the criteria established in chapter 8 this plan identified the needed improvements to be completed by MCPUD1 and is in the following priority list:

1. Locate and eliminate leaks, reduce DSL to 10% or less
2. Replace well pump, wiring, drop pipe and source meter
3. Install backup power generator
4. Install 4 isolation valves
5. Acquire property for reservoir
6. Replace 2-3 inch mains with 6 inch mainline (phased construction)
7. Construct 35,500-gallon reservoir
8. Construct booster station and building
9. Install draft hydrant at reservoir
10. Install 3 sampling stations
11. Install 3 blow offs
12. 10 Year update of WSP

IMPROVEMENT SCHEDULE

PROJECT TITLE	TYPE OF IMPROVEMENT	DESCRIPTION	PAGE WHERE IDENTIFIED	COST ESTIMATE	YEAR
DSL reduction	Maintenance	Conduct water loss survey, repair leaks, reduce DSL to 10%	4.3	\$20,000	2019
Well 1 Improvements	Replacement	Replace well pump w/ new pump, wiring, drop pipe	1.4	\$4,600	2019
Sampling Stations	Installation	3 new sampling stations	3-19	\$4,600	2019
Source Meter	Replacement	New source meter for Well 1	1-4	\$2,700	2019
Back-up Generator	Installation	Install emergency power backup	3-6	\$30,000	2019
Mainline Replacement	Construction	Replace 1000' of mainline with 6"	3-18	\$55,000	2019
			2019 Total	\$116,900	
Blow Offs	Installation	3 new blow offs	3-20	\$2,700	2022
Property	Acquisition	Acquire property for new reservoir	3-18	\$13,200	2022
Valves	Installation	4 new isolation valves	3-19	\$2,900	2022
Mainline Replacement	Construction	Replace 1000' of mainline with 6"	3-18	\$55,000	2022
			2022 Total	\$73,800	
Mainline Replacement	Construction	Replace 1000' of mainline with 6"	3-18	\$55,000	2024
Water Main	Replacement	Upgrade 2" loop to 6"	3-19	\$21,900	2024
			2024 Total	\$76,900	
Reservoir	Construction	35,000-gallon concrete reservoir	3-18	\$103,900	2026
Booster Station	Construction	Booster pumps and building	3-19	\$122,000	2026
Draft Hydrant	Installation	New draft hydrant	3-19	\$2,020	2026
			2028 Total	\$227,920	
WSP Update	Planning	10-year update of WSP		\$37,000	2028
			2028 Total	\$37,000	

FINACIAL PROGRAM

Historically, water systems tend to finance large capital improvement projects, where general funds or reserves are not adequate to provide the needed capital, using long-term debt. The sources of the debt issuances are Public Works Trust Fund (PWTF), Federal Housing Administration (FHA) or private financing (banks). The sizes of the PUD systems make it prohibitive to enter the bond market. These types of financing sources are used only for capital projects for the Agate Beach Water System. MCPUD1 encourages the least cost issuance. Meter rates nearly double if bank loans are used due to their high costs and are avoided where possible.

Revenue for the past six years has been steady, and the system currently has no debt payments. The average annual surplus is approximately \$3900. The Agate Beach Water System financial statement for 2012 through 2017 is shown in Chapter 9.

Twanoh Heights Community Club Water System Plan Part B

Executive Summary

This water system plan was written using the Washington State Department of Health (DOH) *Water System Planning Handbook*, April 1997. *Water System Plans (WSP)* are required for the following system categories per WAC 246-290-100 and WAC 246-291-140. *Water System Plans* are required to be updated at least every ten years or when proposed projects are not included in the current *WSP* and a State Environmental Policy Act review is required.

Mason County Public Utility District No. 1 (MCPUD1 or the District) owns and manages the Twanoh Heights Community Club Water System (#00153Y) located 6.5 miles West of Belfair and 7.2 miles East of Union in Section 21, Township 22 North, Range 2 West, Willamette Meridian.

MCPUD1 The Twanoh Heights Community Club Water System is a Group A system currently serving 44 connections. The system is currently approved to serve 75 connections. It was acquired by MCPUD1 in 2004. Without maintenance or improvements to the water system Twanoh Heights Community Club Water System will not be able to provide future connections.

INTRODUCTION

The Twanoh Heights Community Club Water System is a Group A system currently serving 44 connections. The system was designed and constructed in 1978 to serve the single family residential Twanoh Heights Community Club Development. The system was originally constructed, owned and operated by the developer. This development consisted of 36 sub-dividable lots with the obligation that the water system would be able to serve a total of 86 lots inside the Twanoh Heights Community Club Development. Historical water use rates for this water system are in conflict with the annual withdrawal allowed by the existing water rights and have caused PUD1 to limit the total number of service connections to 75, rather than the desired 86 connections. The system is equipped with a source meter, and the District completed installation of service meters as of February 2016.

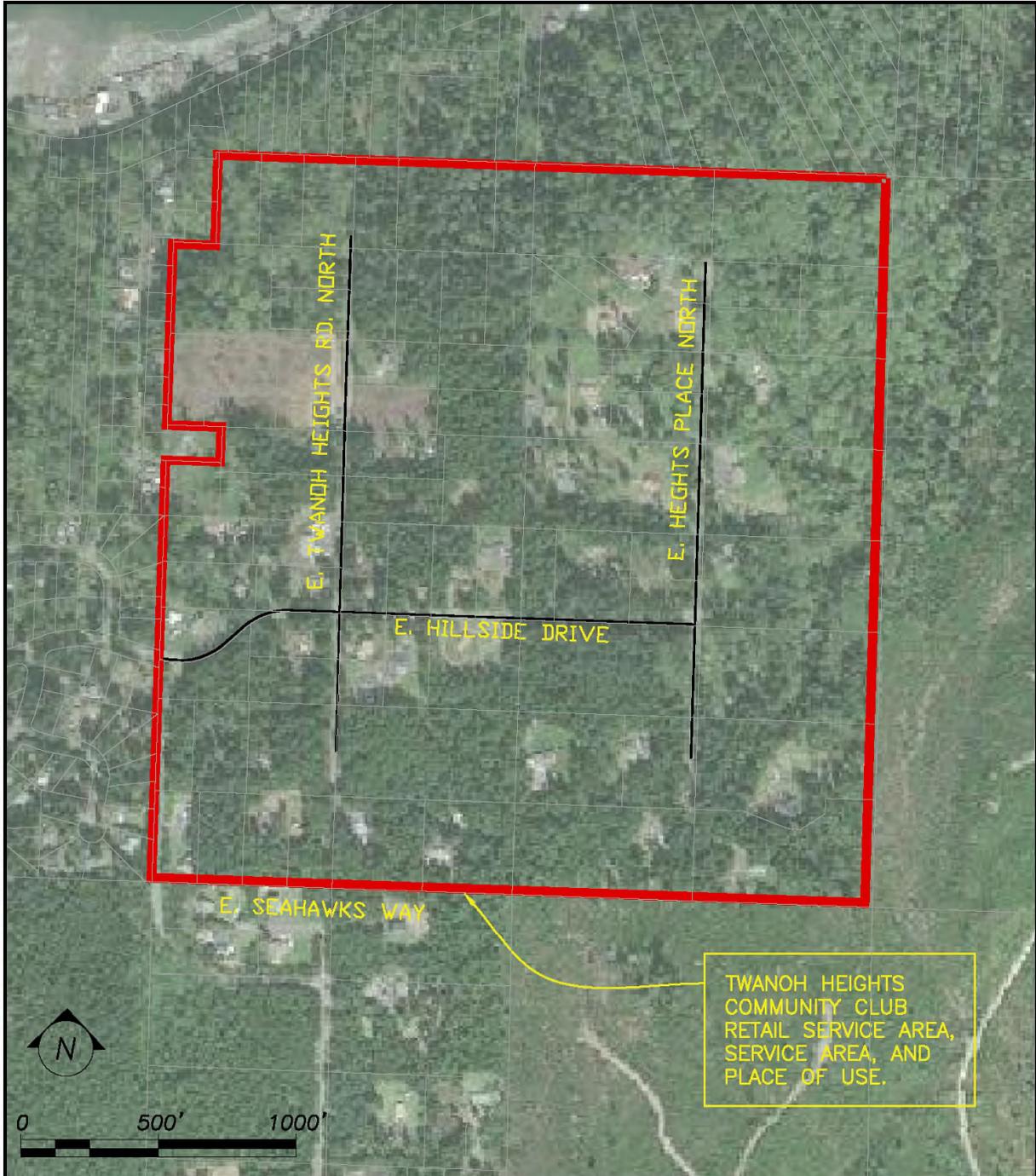
This plan provides basic information about the water system per WAC 246-290-100, WAC 246-293-250 and WAC 246-295. The following topics will be covered in the discussion:

- A. Ownership and Management
- B. System Background
- C. Inventory of Existing Facilities
- D. Related Plans
- E. Existing Service Area Characteristics
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- K. Complaints

The system is approved for 75 connections. According to the WFI and the *connected customer* list provided by MCPUD1, there are currently 44 active residential connections.

SERVICE AREA

The existing retail service area for Twanoh Heights Community Club Water system is currently zoned in The *Mason County Comprehensive Plan* as Rural Residential 5 which means residential density cannot exceed one residence per five acres.



MASON PUD NO. 1 21971 N. US HIGHWAY 101 SHELTON, WA 98584						TWANOH HEIGHTS COMMUNITY CLUB WSP RETAIL SERVICE AREA	
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In 2016, MCPUD1 made a request to DOH to create a combined Twanoh Water System and was met by heavy public resistance and the plan was not approved by the MCPUD1 Board of Commissioners and at this time will remain as an individual water system.

EXISTING SYSTEM DEMAND

Historic source meter data is available beginning in 2006. Service meters were installed beginning in 2013 however data indicates the system wasn't fully metered until 2016. For this WSP, recorded metered data from 2016 through 2017 will be used. According to 2016 and 2017 recorded data, Average Day Demand (ADD) is the average water usage in gallons per day per Equivalent Residential Unit (gpd/ERU) that a typical single-family home in the water system can expect to consume. ADD for the Twanoh Heights Community Club Water System is **221** gpd/ERU based on source production.

The current Peak Hourly Demand (PHD) is **115.17** gpm and is **beyond** the instantaneous water rights for well production, because of the existing reservoir and the well pump flow rate, the groundwater withdrawal rate does not exceed the maximum of **105 gpm**. Based on water use records, average Distribution system leakage (DSL) is 9% which meets the required ten percent standard set by DOH. As this is an aging system it is expected that the District will locate and repair the source of leakage on an ongoing basis.

PROJECTED SYSTEM DEMAND

Based on the 20-year water demand forecasts the retail service area will remain within the Twanoh Heights Community Club Development. Beyond the 20-year planning period, expanding the service areas outside the Twanoh Heights Community Club Development may be necessary to put the water rights to full beneficial use. Water rights are sufficient to expand the system beyond the current service area. The maximum zoning density allowed for Rural Residential 5 is one primary residence per 5 acres. Full build-out will exceed the density but the lots were established per prior County zoning. Water rights are discussed in Chapter 4 of this document. System deficiencies and proposed solutions are discussed in Chapters 3 and 8.

TREATMENT

There is no permanent treatment for the Twanoh Heights Community Club Water System. A temporary chlorination system that uses direct injection of sodium hypochloride at the source is available for use when there is a positive result from the coliform testing.

With the implementation of The Revised Total Coliform Rule in April 2016, there is no longer a Non-Acute coliform MCL. Instead, the same conditions that previously resulted in a Non-Acute MCL violation will trigger a Level 1 Assessment. The water system owner will be required to assess their water system to identify any sanitary defects that allowed coliform to enter the distribution system, or a failure or imminent failure of an existing barrier. No violation will occur, and no public notification will be required, but an assessment report must be prepared and submitted to DOH within 30 days. A Level 1 Assessment Report template is included in Appendix E.

WATER SYSTEM EFFICIENCY USE PROGRAM

The District Board adopted water use efficiency goals and measures for the Twanoh Heights Community Club Water System on August 12, 2014. Objectives of the District's conservation plan are to have distribution system leakage meet the 10% state standard. DSL will be determined three years after the system is fully metered.

Goals for the Twanoh Heights Community Club Water System are:

1. Implement metered billing rates three months after the system is fully metered.

2. Reduce peak month production by 1% per ERU by 2015.
3. Reduce total annual water production by 1% in 6 years.

These goals are currently being met in the aging system (approximately 9%). Approval of this plan will implement a water loss action plan for the system.

SOURCE PROTECTION

MCPUD1 has developed Sanitary Control Areas and protective covenants for each water source which are on file with the Mason County Environmental Health Department. Protective well radii are a minimum 100 feet, unless a variance has been granted for a smaller radius. The protective covenants do not allow for any source contamination (livestock, hazardous material storage) within the 100-foot radius. The wellhead protection radius for the Twanoh Heights Community Club Water System was established using the Calculated Fixed Radius method as allowed by DOH. MCPUD1 developed the *Wellhead Protection Program* by coordinating with local and state agencies as part of its water system management for forty-two water systems within Mason County. The *Wellhead Protection Plan* is also part of the *Water System Plan Part A* for MCPUD1. The District distributes wellhead protection information to system users to educate them. When warranted, additional information is provided to property owners and occupants adjacent to or may have a direct impact on the wellhead protection area and watershed control area. A "Well Head Protection Notice" is sent to property owners within the 10-year zones of contribution. An example of the letter can be found in Appendix D.

OPERATIONS AND MAINTENANCE PLAN

MCPUD1 provides day-to-day operations with water department staff performing all routine operational procedures for the water system overseen by the Director of Operations. Water staff also coordinates preventative maintenance of the water system. The Director of Operations - Oversees all engineering design, construction contract management and water supply operations for PUD No.1. Oversees all construction, coordinates all field maintenance and metering reading operations; oversees engineering designs and standards; review plans, water system compliance and construction management. The Director of Operations - Relies on consulting civil engineers, that are licensed in the State of Washington to help in this endeavor. The plan also includes water quality control, emergency response, cross-connection control, implementation of the improvement program, Budget formation, complaint response, public and press contact and billing.

SYSTEM PROPOSED IMPROVEMENTS

In order to serve 75 ERU (75 connections), an additional 14,000 gallons of storage is required at full build out, Pressure reducing valves, new well pumps to provide redundancy, generator and auto transfer switching. The proposed improvements would require increased line sizes. The capacity analysis of the system at full build out shows that the system has the ability serve 75 ERU or 75 connections. Without a booster pump station or elevated reservoir and additional storage the system will be limited to 62.7 ERU or 57 full time connections which includes DSL.

IMPROVEMENT PROGRAM

Based on the criteria established in chapter 8 this plan identified the needed improvements to be completed by MCPUD1 and is in the following priority list:

System improvements identified as needing to be addressed within the 10-year planning period include:

1. Pressure reduction valves
2. Construct additional water storage reservoir, booster station, well pumps and associated appurtenances for anticipated growth.
3. Abandon Well 2 per DOH requirements
4. Water system plan update - 2028

IMPROVEMENT SCHEDULE

PROJECT TITLE	TYPE OF IMPROVEMENT	DESCRIPTION	COST ESTIMATE	FINANCING SOURCE	YEAR
Well 1 pump replacement	Replacement	Replace single pump with 2 pumps	\$30,000	Loan	2019
Well 2 decommissioning	Source reliability	Cap well and decommission	\$6,000	Reserves	2019
		2019 TOTAL	\$36,000		
Standby generator or socket	Construction	Backup power source at pump station	\$73,000	Loan	2020
Reservoir cleaning and inspection	Maintenance	Inspect and clean reservoir	\$10,300	Reserves	2020
Booster pump replacement	Replacement	Replace JHG pump with TPL pump	\$5,000	Reserves	2020
		2020 TOTAL	\$88,300		
Install PRVs	Construction	Install PRVs in 2 locations	\$29,000	Loan	2022
Reservoir well pump control switch	Replacement	Replace float switch with pressure transducer	\$3500	Reserves	2022
		2022 TOTAL	\$32,500		
WSP update	Planning	Update WSP	\$37,000	Loan	2028
		2028 TOTAL	\$37,000		

FINACIAL PROGRAM

Historically, water systems tend to finance large capital projects where general funds or reserves are not adequate to provide the needed capital using long-term debt. The sources of these debt issuances are Public Works Trust Fund (PWTF), Federal Housing Administration (FHA), or private financing (banks). The size of the systems makes it prohibitive to enter the bond market. These types of financing sources are used only for Capital Projects for the Twanoh Heights Community Club Water System. Meter rates nearly double if bank loans are used due to their higher costs and are avoided where possible.

Revenue for the past six years has been steady, and the system currently does not have debt payments. The average annual surplus is approximately \$4397.45.00. The Twanoh Heights Community Club Water System financial statement for 2012 through 2017 is shown in Chapter 9.

Twanoh Terrace Water System Plan Part B

Executive Summary

This water system plan was written using the Washington State Department of Health (DOH) *Water System Planning Handbook*, April 1997. *Water System Plans (WSP)* are required for the following system categories per WAC 246-290-100 and WAC 246-291-140. *Water System Plans* are required to be updated at least every ten years or when proposed projects are not included in the current *WSP* and a State Environmental Policy Act review is required.

Mason County Public Utility District No. 1 (MCPUD1 or the District) owns and manages the Twanoh Terrace Water System (#60190M) located 6.5 miles West of Belfair and 7.2 miles East of Union in Section 28, Township 22 North, Range 2 West, Willamette Meridian.

Mason County Public Utility District No. 1 (MCPUD1 or the District) is obligated to serve the approved 39 connections (28 current with 11 reserved) and has a duty to serve the 72 developable lots with water from the Twanoh Terrace Water System. However, the zoning density and service area will only allow for 37 connection at full buildout (FBO), Twanoh Terrace was acquired by MCPUD1 in 2009. Without maintenance or improvements to the water system,

INTRODUCTION

Twanoh Terrace water system is a Group A system currently serving 28 physical connections and was constructed between March 1989 and completed in October 1989. Construction was to be carried out in two phases. Phase 1 was the development of connections 1-39. Phase 2 would have been for the remaining 33 connections, up to the 72 maximum. It was acquired by MCPUD1 in 2009. The system is equipped with a source meter, and the District completed installation of service meters as of February 2016.

This plan provides basic information about the water system per WAC 246-290-100, WAC 246-293-250 and WAC 246-295. The following topics will be covered in the discussion:

- A. Ownership and Management
- B. System Background
- C. Inventory of Existing Facilities
- D. Related Plans
- E. Existing Service Area Characteristics
- F. Future Service Area
- G. Service Area Agreements
- H. Service Area Policies
- I. Satellite Management Agencies
- J. Conditions of Service
- K. Complaints

The system is approved for 39 connections. According to the WFI and the *connected customer* list provided by MCPUD1, there are currently 28 active residential connections and 11 reserved connections.

SERVICE AREA

The existing retail service area for Twanoh Terrace is currently zoned in The *Mason County Comprehensive Plan* as Rural Residential 5 which means residential parcels must be at least five acres. Service area, retail service area and place of use is shown below.



MASON PUD NO. 1 21971 N. US HIGHWAY 101 SHELTON, WA 98584					TWANOH TERRACE WSP SERVICE AREA MAP	
REV	DATE	REVISION DESCRIPTION	DESIGNER	REVIEWER	CONTRACT NO:	BKI PROJECT NO: MA17-015
					 BKI BROWN & KY SAR, INC.	0 REVISION
					THIS LINE IS 1" LONG AT THE CORRECT SCALE	
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In 2016, MCPUD1 made a request to DOH to create a combined Twanoh Water System which was met by heavy public resistance and the plan was not approved by the MCPUD1 Board of Commissioners and at this time it will remain as an individual water system.

EXISTING SYSTEM DEMAND

Historic source meter data is available beginning in 2011, although the system wasn't monitored for the full year. Service meters were installed beginning in 2015, the system wasn't fully metered until April of 2016. For this WSP, recorded metered data from 2016 through 2017 will be used. According to 2016 and 2017 recorded meter data, Average Daily Demand (ADD) is based on Equivalent Residential Units (ERU) which is the amount of water consumed by a typical full time single family residence for the specific system. ADD for the Twanoh Terrace Water System is **174** gpd/ERU based on source production.

The current Peak Hourly Demand (PHD) is **61.38** gpm and is not beyond the instantaneous water rights of 90 GPM. The Distribution System Loss (DSL) the system is experiencing is 219,807 Gallons based on the two-year average of 2016-2017 meter data. Based on two years of water use records (2016-2017), distribution system leakage is 12.5%, which does not meet the required ten percent standard set by DOH. Consequently, the projections for future water demand and capacity are very conservative, as the analysis is based on existing conditions. It is expected that the District will locate and repair the source of leakage. Therefore, the long-range projections may not reflect the system once DSL has been reduced to the 10% state standard.

PROJECTED SYSTEM DEMAND

Based on the 20-year water demand forecasts, additional water rights will not be required. In order to put the water right to full beneficial use, the system would have to expand the service area since zoning density restrictions will not allow further lot development within the water system. The maximum zoning density allowed for Rural Residential 5 is one primary residence per 5 acres. Full build-out will exceed the density but the lots were established per prior County zoning. Water rights are discussed in Chapter 4 of this document. System deficiencies and proposed solutions are discussed in Chapters 3 and 8.

TREATMENT

There is no permanent treatment for the Twanoh Terrace Water System. A temporary chlorination system that uses direct injection of sodium hypochloride at the source is available for use when there is a positive result from the coliform testing.

Only one positive coliform sample is on record for the Twanoh Terrace water system. A sample taken on August 18, 2009 was positive for total coliform, but not fecal coliform or E. Coli. Since it takes two or more positive samples to make a coliform MCL violation, the Twanoh Terrace Water System has had no prior coliform MCL violations. It is unlikely that treatment to improve water quality will be required in the 10-year or the 20-year planning periods. A summary of the water testing results is located in Appendix D

WATER SYSTEM EFFICIENCY USE PROGRAM

The District Board adopted water use efficiency goals and measures for the Twanoh Terrace Water System on August 12, 2014. Objectives of the District's conservation plan are to have distribution system leakage meet the 10% state standard. Distribution system leakage (DSL) will be determined three years after the system is fully metered.

Goals for the Twanoh Terrace Water System are:

1. Implement metered billing rates three months after the system is fully metered.
2. Reduce peak month production by 1% per ERU by 2015.
3. Reduce total annual water production by 1% in 6 years.

These goals are currently not being met because of the high DSL in the aging system (approximately 12.5%). Approval of this plan will implement a water loss action plan for the system.

SOURCE PROTECTION

MCPUD1 has developed Sanitary Control Areas and protective covenants for each water source which are on file with the Mason County Environmental Health Department. Protective well radii are a minimum of 100 feet, unless a variance has been granted for a smaller radius. The protective covenants do not allow for any source contamination (livestock, hazardous material storage) within the 100-foot radius. The wellhead protection radius for the Twanoh Terrace Water System was established using the Calculated Fixed Radius method as allowed by DOH. MCPUD1 developed the *Wellhead Protection Program* by coordinating with local and state agencies as part of its water system management for forty-two water systems within Mason County. The *Wellhead Protection Plan* is also part of *the Water System Plan Part A* for MCPUD1. The District distributes wellhead protection information to system users to educate them.

When warranted, additional information is provided to property owners and occupants adjacent to or may have a direct impact on the wellhead protection area and watershed control area. A "Well Head Protection Notice" is sent to property owners within the 10-year zones of contribution. An example of the letter can be found in Appendix D.

OPERATIONS AND MAINTENANCE PLAN

MCPUD1 provides day-to-day operations with water department staff performing all routine operational procedures for the water system overseen by the Director of Operations. Water staff also coordinates preventative maintenance of the water system. The Director of Operations - Oversees all engineering design, construction contract management and water supply operations for PUD No.1. Oversees all construction, coordinates all field maintenance and metering reading operations; oversees engineering designs and standards; review plans, water system compliance and construction management. The Director of Operations - Relies on consulting civil engineers, that are licensed in the State of Washington to help in this endeavor. The plan also includes water quality control, emergency response, cross-connection control, implementation of the improvement program, budget formation, complaint response, public and press contact, and billing.

SYSTEM PROPOSED IMPROVEMENTS

In order to serve 37 ERU (37 connections), a 20-foot diameter by 10 feet tall reservoir would have to be constructed and provide 23,000 gallons of storage. The proposed improvements would require an 8-inch PVC transmission main from the well to the reservoir to the distribution system and a 6-inch PVC main, Booster pumps station with 2 to 3 pumps, pressure reducing valve at the intersection of East Meadow Mist Place and East Kingsley Drive and associate main improvements.

IMPROVEMENT PROGRAM

Based on the criteria established in chapter 8 of this plan identified the needed improvements to be completed by MCPUD1 and is in the following priority list:

System improvements identified as needing to be addressed within the 10-year planning period include:

1. Distribution system repairs to reduce leakage
2. Construct water storage reservoir, booster station and associated appurtenances for anticipated growth
3. Water system plan update - 2028

IMPROVEMENT SCHEDULE

PROJECT TITLE	TYPE OF IMPROVEMENT	DESCRIPTION	COST ESTIMATE	FINANCING SOURCE	YEAR
Construct Water Storage Reservoir	Construction	Construct new reservoir to provide system with storage and meet PHD performance requirements 20'diameter x10' tall (23,500 gal)	\$120,000	Loan	2021
Construct Booster Station	Construction	Construct booster station to provide system to meet PHD performance requirements	\$30,000	Loan	2021
PRV Install	Installation	Install PRV at E, Meadow Mist Place	\$2500	Reserves	2021
			2021 Total	\$152,500	
Distribution System Leakage Repairs and Replacement	Replacement	Repair/replace 1000 feet of distribution infrastructure contributing to losses due to leakage	\$55,000	Loan	2023
			2023 total	\$55,000	
Distribution System Leakage Repairs and Replacement	Replacement	Repair/replace 1000 feet of distribution infrastructure contributing to losses due to leakage	\$55,000	Loan	2026
			2026 Total	\$55,000	
WSP Part B Update	Planning	10 Year Update of the WSP	\$33,000	Loan	2028
			2028 Total	\$33,000	

FINACIAL PROGRAM

Historically, water systems tend to finance large capital projects where general funds or reserves are not adequate to provide the needed capital using long-term debt. The sources of these debt issuances are Public Works Trust Fund (PWTF), Federal Housing Administration (FHA), or private financing (banks). The size of the systems makes it prohibitive to enter the bond market. These types of financing sources are used only for Capital Projects for the Twanoh Terrace Water System. Meter rates nearly double if bank loans are used due to their higher costs and are avoided where possible.

Revenue for the past six years has been steady, and the system currently does not have debt payments. The average annual surplus is approximately \$1047.00. The Twanoh Terrace Water System financial statement for 2012 through 2017 is shown in Chapter 9.