DRAFT PROJECT DESCRIPTION

West Lake Tahoe
Regional Water Treatment Plant

Prepared for:

Tahoe City Public Utility District
PO Box 5249
Tahoe City, CA 96145

Prepared by:

DUDEK
853 Lincoln Way, Suite 208
Auburn, California 95603

APRIL 2015

Project Overview

The Tahoe City Public Utility District (TCPUD) proposes to construct a new domestic drinking water treatment plant (WTP) utilizing Lake Tahoe surface water as its source. The new WTP would replace an existing interim WTP and would provide reliable and safe drinking water to the West Lake Tahoe region. The project is called the West Lake Tahoe Regional Water Treatment Plant (WLTRWTP).

The proposed WLTRWTP would serve primarily residential land uses and limited commercial and recreational land uses. The primary service area would be the TCPUD's McKinney-Quail Water Service Area (MQWSA). The project may also serve the service areas of other water systems in the area.

Project Location

Three potential locations for the WLTRWTP are under consideration. Each is a vacant parcel west of State Route (SR) 89. The project would also include the reconstruction of an existing water intake pump station and pipeline at one of two locations (Chambers Landing Beach or McKinney Shores Beach) and new water transmission pipelines between the intake station and the treatment plant. A regional map is provided in Figure 1 and a vicinity map is provided in Figure 2 (All Figures are located at the end of this document). Aerial maps of each of the potential treatment plant project locations are provided in Figures 3, 4, and 5. The three potential WLTRWTP sites are:

Lodge Road: At this location, the WLTRWTP would be constructed adjacent to Lodge Road on the northern portion of an approximately 6.5-acre vacant parcel, as shown on Figure 3. This parcel contains two of the proposed sites and is referred to herein as the "Chamberland/Lodge" parcel. This Chamberland/Lodge parcel is owned by the California Tahoe Conservancy (CTC). The Lodge site is adjacent to residences and immediately west of SR 89. The Tahoe City to Sugar Pine bike trail runs between SR 89 and the Chamberland/Lodge parcel. This site would utilize a reconstructed lake intake at the Chambers Landing beach, which is located across SR 89, approximately 0.2 miles from the Lodge site.

Chamberland Drive: At this location, the WLTRWTP would be constructed in the central portion of the Chamberland/Lodge parcel, with access from the intersection of Chamberland Drive and Flicker Avenue, as shown on Figure 4. The Chamberland site is also adjacent to residences and immediately west of SR 89. The Tahoe City to Sugar Pine bike trail runs between SR 89 and the Chamberland/Lodge parcel. There is a Stream Environment Zone (SEZ) as designated by the Tahoe Regional

Planning Agency (TRPA) located along the southern boundary of the Chamberland site; the proposed site improvements would be located outside of the SEZ. This site would utilize a reconstructed lake intake at the Chambers Landing beach, which is located across SR 89, approximately 0.2 miles from the Chamberland site.

Lagoon Road: At this location, the WLTRWTP would be constructed adjacent to Lagoon Road on an approximately 23-acre vacant parcel owned by the TCPUD, as shown on Figure 5. The Lagoon site is adjacent to residences and the Homewood Mountain Resort ski area. Relative to the Lodge and Chamberland sites, the Lagoon site is set farther back into the residential neighborhood and is approximately 0.25 miles east of SR 89. This site would utilize a reconstructed lake intake at the McKinney Shores beach, which is located across SR 89, approximately 0.25 miles from the Lagoon site.

Project Background and Need

Background

Water service along the west shore of Lake Tahoe suffers from an inefficient, disjointed delivery system. There are fourteen separate water systems, under different ownerships, between Sunnyside and Emerald Bay. These fourteen systems serve approximately 4,700 water service connections. Each system utilizes different groundwater sources, creating inefficient redundancies in delivery. Most are more than 40 years old. Many of these water systems lack permitted backup water supplies and/or have primary drinking water quality compliance issues as regulated by the State of California State Water Resources Control Board, Division of Drinking Water (DDW). Most systems are significantly undercapitalized, which creates a challenge in making the investments necessary to meet all of today's drinking water standards.

The TCPUD's MQWSA system is one of these water systems. The MQWSA is an isolated sub-system of the TCPUD located between Homewood and Tahoma. The system extends roughly from Moana Circle in the south to Tahoe Ski Bowl Way in the north and includes the Tahoma Meadows neighborhood. The MQWSA serves 559 water service connections and has, historically, experienced a number of water supply and water quality deficiencies or concerns. The MQWSA is currently in compliance with DDW primary and secondary source of supply and drinking water quality standards. However, this compliance is of concern, as described below, given the age, condition, and configuration of the water supply sources.

The MQWSA currently has three different water supply sources:

- Crystal Way groundwater well (McKinney Well No. 3) – This well was constructed in 1994 with an estimated maximum capacity of 500 gallons per minute (gpm). Until 2004, this was the only water source for the MQWSA and the system was not in compliance with DDW secondary (backup) source requirements. From the time the well was put into service, it began showing a steady decline in static and dynamic groundwater levels due to over-withdrawal. The groundwater level decline has stabilized at about 70% of the original level with the construction of the additional interim sources described below. This stabilization has occurred because the well is no longer being used to satisfy the year round system demand. Based on this, the sustainable capacity of this well is far less than 500 gpm, closer to the winter time maximum demand in the MQWSA, which is generally 70-100 gpm. Furthermore, this well has corrosive water quality issues and has exhibited Lead and Copper Rule non-compliance issues.

- Interim Surface Water Treatment Plant (ISWTP) at Chambers Landing – The ISWTP was constructed in the spring of 2004 and is supplied Lake Tahoe water through an existing lake intake on Chambers Landing beach. The plant has a permitted capacity of 300 gpm. It was constructed utilizing re-purposed filtration equipment and was permitted on an interim and emergency basis (not permanent). It is not enclosed in a building and, therefore, cannot be operated during winter months (November to April) and must be shut down and winterized each year.

- Emergency Interconnection with McKinney Water District – This two-way emergency interconnection with the McKinney Water District (an adjacent public water system) was constructed in 2010. The interconnection is available to provide emergency water supply (up to 175 gpm) to either system and is governed by a memorandum of understanding between the two agencies. The primary water supply in the McKinney Water District complies with DDW water quality standards. However, it is not under the control of the TCPUD. The interconnection currently serves as the MQWSA's secondary (backup) water source during the times the ISWTP is shut down.

Three other potential water sources exist, but are not used, within the MQWSA. McKinney Well No. 1 has been shut down due to high iron and manganese content. A test well (McKinney Well No. 2) was drilled at the top of Grouse Drive. However, it was not completed for production due to also exhibiting high iron and manganese content. To utilize either of these wells for water supply would require groundwater treatment to comply with DDW drinking water quality standards. This treatment plant would be similar

in magnitude and process as that proposed for the WLTRWTP. Finally, the McKinney Shores Lake Intake consists of a lake intake with a single lake pump. This intake is currently not connected to the MQWSA. The existing McKinney Shores intake has a limited capacity (approximately 175 gpm) and does not include a surface water treatment plant.

The MQWSA is adjacent or nearby to a number of other private and public water systems that face similar or more significant source of water supply issues. In many cases, the systems do not have adequate or reliable secondary (backup) water sources. A water treatment plant sized to provide regional water supply capacity to some or all of these systems would provide a far more cost-effective solution than each system resolving their supply issues independently.

Project Purpose & Need

The TCPUD is proposing to construct the new West Lake Tahoe Regional Water Treatment Plant (WLTRWTP) to address water supply issues identified above for the MQWSA and to provide the foundation for a coordinated and regional drinking water supply solution for a portion of the west shore area of Lake Tahoe. The WLTRWTP would provide a permanent, all-season, reliable, and drought-resistant drinking water supply to the MQWSA and, potentially, other water systems within the region. Specifically, it would:

- Replace the water supply to the MQWSA currently provided by the Interim Surface Water Treatment Plant. The ISWTP has reached the end of its service life, is expensive to operate with annual shut-downs and startups, and is not permitted for long term use. It must be replaced with a permanent all-season water supply source.

- Serve as the primary water source for the MQWSA paired with the McKinney Well No. 3 as the permitted secondary (backup) source in full compliance with DDW source of supply regulations. Placing McKinney Well No. 3 in the secondary source position would preserve its sustainable capacity and maintain an acceptable static water level. The stabilization of Well No. 3 groundwater levels after the construction of the ISWTP clearly indicates that this well is better utilized in a backup position.

- Remove the reliance upon the emergency inter-connection to McKinney Water District as the MQWSA's winter-time permitted secondary source. Inter-connections should not be relied upon as secondary sources of supply. They are intended for short term, extreme emergencies, are governed by a memorandum of understanding, and are outside the control of the TCPUD.

- Reduce the TCPUD's and other area water suppliers' reliance upon groundwater, which has historically shown water quality issues and capacity limitations. Adding to capacity reliability concerns of groundwater is the impacts caused by climate change. A decreased snowpack and increased rainfall will likely negatively impact the resiliency of groundwater sources as groundwater recharge from increased rainfall is not as favorable as recharge from a melting snowpack.

- Potentially provide regional source water to adjacent or nearby water systems; either through wholesale agreements or by consolidation. In particular the following water systems are within the potential service area of the WLTRWTP and represent approximately 2,480 service connections:

    - Madden Creek Water Company
    - Tahoe Cedars Water Company
    - Tahoe Pines/Tahoe Swiss Village Water Company
    - Skyland/Nielsen Water Company
    - Timberland Water Company

- Improve various environmental factors (scenic, noise, water quality) associated with the current ISWTP and lake intake facilities. The new WLTRWTP would be constructed inside a building on high-capability lands; whereas, the ISWTP is located outside and in an environmentally sensitive area. Furthermore, the large above-ground concrete and steel lake intake vault would be potentially be removed from the public beach at Chambers Landing with the project.

The TCPUD has elected to utilize Lake Tahoe surface water because it would provide:

- A predictable and reliable quantity and flow rate of water supply;

- A drought-resistant and year-round water source;

- Consistent source water quality allowing for predictable and proven treatment processes and flow rate; and

- A diversified source when paired with groundwater, giving the TCPUD the most flexibility to operate the water system efficiently.

While groundwater has historically been an adequate source of water supply, it is subject to a number of concerns:

- It provides an unpredictable long term yield because the wells in the area are located in hard-rock formations. Until a well is completed, tested and operated for a

number of years, under actual demand, the true capacity of the well cannot be reliably predicted.

- Due to the hard-rock formations of the aquifers in the area, it is subject to static level declines from overproduction further limiting a well's future reliable capacity.

- It is subject to unpredictable water quality issues. In particular, the TCPUD has encountered iron and manganese in the two inactive wells. Additionally, the McKinney Well No. 3 has begun to show corrosive water quality leading to lead and copper water quality issues. The two inactive wells would require iron and manganese removal water treatment, similar in scope to that proposed for the WLTRWTP project, to meet water quality standards.

- It is subject to future regulations requiring additional treatment, which may become equivalent to that necessary for surface water. In particular, lowered arsenic and manganese Maximum Contaminant Limits (MCLs) are under discussion by the USEPA and the State of California recently adopted a new Hexavalent Chromium MCL for groundwater supplies.

- Climate change will impact the recharge of groundwater sources, especially hard rock wells such as those found on the west shore of Lake Tahoe and continue to diminish the long term reliability and resiliency of these wells.

Project Description

The WLTRWTP Project (project) would include the following components, which are described in more detail below and shown on Figures 3, 4, and 5:

- lake intake pump station and lake intake pipeline (two potential locations are under consideration)

- raw water pipeline from lake intake facilities to the proposed water treatment plant (WTP),

- intake pump station electrical and chemical feed room (two potential locations are under consideration),

- WTP facility (three potential locations are under consideration),

- various water distribution system improvements (pipelines) to distribute treated water from the WTP to the existing water distribution system,

- decommission and removal of the existing ISWTP, and
- potentially a public parking lot and public restrooms to improve access to recreational facilities in the vicinity.

Existing Interim Surface Water Treatment Plant (ISWTP)

As described above, the TCPUD constructed the existing ISWTP in the spring of 2004. It has a permitted capacity of 300 gallons per minute. The existing ISWTP pumps water from Lake Tahoe via a lake intake pump station located on the Chambers Landing beach. An existing 6- and 8-inch raw water suction pipeline runs for 650 feet from the vault out into the lake. The pump station controls are located in the vault and inside the Chambers Landing swimming pool maintenance room. The treatment process uses a roughing filter and polishing filter before the water is disinfected using sodium hypochlorite addition. The WTP produces water that is compliant with current drinking water standards. Filter backwash water is discharged to on-site holding tanks. The TCPUD periodically pumps out the solids from the backwash holding tanks for off-site disposal.

Upon completion of the WLTRWTP project, the existing ISWTP would be fully decommission and removed. All facilities would be removed from the paved area surrounding the TCPUD's McKinney Sewer Lift Station (current site of the ISWTP) and from the Chambers Landing swimming pool maintenance room. In addition, if the Chambers Landing Beach intake location is selected, the existing pump station vault located on the beach would be removed and the beach area restored. For Phase I at the Chambers Landing Beach intake location, the existing 6- and 8-inch lake intake line would be reused for the WLTRWTP Lake Intake Pipeline.

Service Area

Figure 6 shows the water systems that may be included within the service area of the proposed WLTRWTP. Table 1 lists the water systems being considered in this evaluation and their current number of water service connections.

Table 1
Proposed Water Service Area and Existing Water Service Connections

Water Agency	Existing Number of Water Service Connections			
	Residential	Commercial	Other	Total
McKinney/Quail Water Service Area (TCPUD)[(a)]	550	9	0	559
Madden Creek Water Co.	160	16	0	176
Tahoe Cedars Water Co.	1,149	7	0	1,156
Tahoe Pines/Tahoe Swiss Village Water Co.	377	0	0	377
Skyland/Nielsen Water Co.	80	0	0	80
Timberland Water Co.	133	1	0	134

(a) Includes the Tahoma Meadows Water Co. service connections as that system is now owned and operated by the TCPUD and is considered a part of the MQWSA.

Treated domestic drinking water would be supplied to the TCPUD's MQWSA through the existing water distribution system. If other water companies request services through the MQWSA, water would be supplied to the other water companies through future interconnections to their distribution systems. Water could be supplied to these other water companies under wholesale purchase agreements, memoranda of understanding, or consolidations.

The Homewood Mountain Resort (HMR) has proposed a redevelopment project within their resort properties. The proposed development is located partially in the TCPUD's MQWSA, partially in the Madden Creek Water Company service area, and partially outside the boundaries of any water provider.

Water System Demands

Water system demands were projected for the water systems within the potential service area of the WLTRWTP. Table 2 below summarizes the existing and projected year 2030 demands for each system. Demand projections included consideration of metering and other system improvements that would enhance water use efficiency and lower unit demands if the water systems are served by the regional project.

Table 2
Existing and Projected Regional Demands Summary

No.	Water System or Sub-System Component	Existing		Projected 2030	
		Average Day (gpm)	Max Day (gpm)	Average Day (gpm)	Max Day (gpm)
1	McKinney/Quail Water Service Area (TCPUD)	90	304	93	313
2	Tahoma Meadows Water Co. (TCPUD)[a]	6	19	6	20
	Homewood Mountain Resort Development[b]				
3	South Base + Mid-Mountain	-	-	12	41
4	North Base	-	-	26	89
	Subtotal HMR Domestic	*0*	*0*	*38*	*130*
5	Madden Creek Water Co.	64	222	37	129
6	Tahoe Cedars Water Co.	151	521	162	558
7	Tahoe Pines/Tahoe Swiss Village Water Co.	81	278	86	298
8	Skyland/Nielsen Water Co.	8	28	9	30
9	Timberland Water Co.	41	141	29	99

(a) Tahoma Meadows Water Co. demands are presented separately from the rest of the MQWSA demands, as they are calculated using different unit demand factors.

(b) HMR development demands are presented separately as they are based on different unit demand factors. Water supply to the HMR development will be supplied by either or a combination of the TCPUD's MQWSA and the Madden Creek Water Co.

Treatment Capacity and Phasing Approach

The WLTRWTP is proposed to be constructed in two phases. Phase I, proposed to be built in 2016 and 2017, would have a maximum design capacity of 650 gpm or 1.0 million gallons per day (MGD). Phase I would provide for the maximum capacity needed to serve the TCPUD's MQWSA, the Madden Creek Water Co., and the Tahoe Cedars Water Co. including the proposed HMR development to be supplied by those water systems. Phase II, if necessary, would provide for an expansion of the maximum design capacity to 1,100 gpm or 1.5 MGD to allow for service to the remainder of the water companies within the potential service area. Phase II would only be constructed as conditions warrant and is intended to represent the maximum capacity that would be needed if all six water companies receive service through the MQWSA. Changes in institutional arrangements and water supply conditions may result in a reduced Phase II capacity. Table 3 summarizes the treatment capacity calculations and phasing approach.

Table 3
2030 Incremental Water Treatment Capacity Needed

	Water System/ Service Area	2030 MDD (gpm)	Cumulative Demand	Assumed Available as Lead Supply (gpm)	System Demand – Supply	Cumulative Supply Capacity Needed (gpm)	WLTRWTP Recommendation
1	McKinney/Quail	313	313	0	313	313	
2	Tahoma Meadows	20	333	0	20	333	
3	HMR South	41	374		41	**374**	**Min. WTP Capacity**
4	HMR North	89	463		89	463	
5	Madden Creek	129	592	0	129	592	
6	Tahoe Cedars	558	1,150	500[(a)]	58	**650**	**Phase I Capacity**
7	Tahoe Swiss Village	298	1,448	0	298	948	
8	Skyland Nielsen	30	1,478	0	30	978	
9	Timberland	99	1,577	0	99	**1,077**	**Potential Phase II**

(a) Tahoe Cedars could be connected to the regional water system in a way that its water source could also supply the regional system. For that reason, its existing well supply capacity can offset the overall demand on the WLTRWTP.

Proposed WLTRWTP

The WTP would receive raw water taken from Lake Tahoe through an intake pump station and lake intake pipeline. The pump station and pipeline would be fully submerged within the lake and connected to an underground raw water pipeline at the shoreline. The lake intake submersible pumps would pump the water from the lake to the lake intake electrical and chemical feed room. At this location, the raw water would be pre-chlorinated by sodium hypochlorite injection and would continue to be conveyed to the WTP and through the treatment processes into the chlorine contactor and operational storage clearwell. This approach avoids the need to "repump" the water at various stages of the treatment process. The treated water would then be pumped from the storage clearwell to the existing distribution system by a pump station inside the WTP building.

The WTP features would likely include a skid mounted membrane filtration process; ultra-violet (UV) disinfection; post-chlorination disinfection for water distribution disinfection residual maintenance; partially buried clearwell for treated water storage; treated water booster pump station; backwash recovery treatment process and underground storage

tanks; recycled water pump station; off-site solids disposal; and permanent standby generator. The individual components of the WLTRWTP Project include the following:

Intake Pump Station

For both lake intake locations being considered (Chambers Landing Beach and McKinney Shores Beach), the Intake Pump Station would be converted from the existing land-based pump station to a submersible pump station. The submersible pump station would be installed below the surface of the lake and would consist of two submersible pumps anchored to the bottom of the lake with an intake screen for each pump. A submerged electrical power cable for each pump would be installed and connected to the intake pipeline. If the McKinney Shores intake were used it also would require a new intake pipeline as the current pipeline is undersized. The new pipeline would follow the same location as the existing intake pipeline and be supported by concrete anchors. At the Chambers Landing Beach location, the intake pump station would be located approximately 650 feet from the shoreline, at the same location as the current pump station intake screen. At the McKinney Shores Beach location, the intake pump station would be located approximately 150 feet from the shoreline, at the same location as the current pump station intake screen. If the Chambers Landing Beach location is selected, the existing vault that contains the current Intake Pump Station would be demolished once it has been replaced by the new submersible pump station. The existing site would be restored to the current beach recreational area that surrounds it.

For each intake location being considered and as described above, new electrical cables to operate the submersible pumps would be constructed between the new Lake Intake Electrical/ Chemical Feed Room and the submersible pumps. This cable would be buried underground between the room and shoreline and strapped to the outside of the Lake Intake Pipeline underwater.

Intake Pipeline

An intake pipeline is necessary to convey lake water from the new Intake Pump Station to the shoreline. For Phase I at the Chambers Landing Beach intake location, no improvements to the existing Chambers Landing intake pipeline are needed. The existing pipeline consists of approximately 650 linear feet of 8-inch and 6-inch diameter pipes from the inlet screen in the lake to the existing pump station on the beach. For Phase II, the existing pipeline would be replaced with a 10-inch diameter line in order to attain the Phase II capacity. At the McKinney Shores Beach location, the existing 4-inch diameter lake intake line would be replaced with a 10-inch lake intake line for Phase I. This size would

be sufficient to accommodate the Phase II capacity, so that no replacement would be necessary for Phase II.

Intake Electrical/Chemical Feed Room

At each intake location being considered, a new Electrical/Chemical Feed Room would be constructed to replace the existing electrical service/control and chemical feed facilities that exist at each of the existing lake intake sites. The room would contain all electrical service, electrical control, and communication facilities necessary to operate the Lake Intake Pump Station. It would also contain chemical storage and feed and injection facilities necessary to pre-chlorinate the raw water being pumped from the lake. Finally, a standby electrical generator would be included to operate the pump station and chemical feed facilities in case of a power outage.

For the Chambers Landing Beach location, the new room would be located on TCPUD property at the existing ISWTP site. The TCPUD's existing McKinney Sewer Lift Station building at this site would be expanded to provide the new separate electrical/chemical feed room.

For the McKinney Shores Beach location, the electrical/chemical feed room would be reconstructed at the site of the existing electrical room, with a minimum footprint of 180 square feet, to accommodate both electrical service and controls and the chemical storage/feed. Depending upon final design and subject to landowner agreement, the building could be expanded beyond the existing footprint (to a maximum of 450 square feet) to accommodate a restroom and/or a permanent standby generator equivalent to that proposed at the Chambers Landing Beach Intake location.

The standby electrical generator would be a permanent diesel generator sized to operate the lake intake submersible pumps, chemical feed facilities, and all other Electrical/Chemical Feed Room facilities. Final sizing would be determined during final design. At the Chambers Landing Beach location, the generator would be located inside the new Electrical/Chemical Feed Room. As this site is located within a floodplain, the Electrical/Chemical Feed Room addition would be designed to be flood resistant with a flood protection door. At the McKinney Shore Intake location, a portable standby electrical generator will be brought to the site during power service interruptions. If agreed upon by the landowner, a permanent standby electrical generator could be located at the site. Depending upon site constraints, it could be located inside the new room or outside and within a sound-attenuating enclosure.

Raw Water Pipeline:

A Raw Water Pipeline would be constructed from the shoreline (starting at the end of the Lake Intake Pipeline) past the Electrical/Chemical Feed Room to the new WTP location. The new Raw Water Pipeline would be 10-inch diameter underground water pipe. The total length of pipe required to be installed at each of the three WTP sites under consideration is summarized below. See Figures 3, 4, and 5 for potential pipeline alignments.

- Lodge Road WTP Site: Approximately 1,700 linear feet of Raw Water Pipeline
- Chamberland Drive WTP Site: Approximately 1,400 linear feet of Raw Water Pipeline
- Lagoon Road WTP Site: Approximately 2,700 linear feet of Raw Water Pipeline

Water Treatment Plant

The WTP would require approximately 3,500 square feet of building space for Phase I and would be expanded by approximately 1,000 square feet for Phase II. A conceptual floorplan is provided in Figure 7. Site improvements associated with the building would include paved driveway, parking, and walkway areas, stormwater conveyance and treatment facilities, and typical utility services (water, sewer, power, and communications). See Figures 8, 9, and 10 for preliminary site plans of each of the three WTP sites being considered, and Figures 11 and 12 for site plans that include parking lots for two of the WTP sites. Construction activities would include site grading and paving, excavation for the building foundation, and partially buried contactor/clearwell tank, and site revegetation and restoration.

Filtration and Disinfection Processes: Water treatment and disinfection would be provided by a multi-barrier approach to comply with State of California's Surface Water Treatment Rule (SWTR) drinking water standards. Filtration would be provided utilizing a packaged microfiltration (MF) or Ultrafiltration (UF) system. Disinfection would be provided with a combination of UV reactors and free chlorine. Packaged microfiltration or ultrafiltration (collectively described as MF) would provide reliable, low turbidity filtered water independent of pre-treatment chemical coagulation and variations in the source water quality and would ensure that applicable California SWRCB DDW standards are met.

Two package MF units would be provided to meet the production for Phase I capacity. A third MF unit would be required for Phase II capacity. It is expected

that the MF units would include a strainer, direct pumping through the membrane unit and backwash supply pipeline from the discharge side of the treated water pump station, membrane elements, and associated piping, valves, instrumentation and controls for the unit. A single separate clean-in-place system, neutralization tank, and compressed air system would be required for the two (Phase I) to three (Phase II) MF units.

Disinfection would be provided with a combination of pressurized ultraviolet disinfection reactors and free chlorine (using liquid sodium hypochlorite). The Phase I WTP capacity would require one duty and one standby UV reactor, with a third UV reactor installed for Phase II.

Because chlorine does not kill pathogens instantaneously on contact, disinfection with chlorine requires the appropriate chlorine concentration and sufficient contact time with the water. A portion of the required disinfection would be achieved with the presence of residual chlorine in the raw water pipeline (injected at the Electrical/Chlorine Feed Room). The remaining disinfection would be achieved in a contactor partition tank, which is currently estimated to be approximately 16,000-gallons and constructed of serpentine reinforced concrete. The contactor tank would be partially-buried onsite and partially below the WTP building. The contactor tank would need to be expanded by about 12,000 gallons for Phase II.

Backwash Handling and Disposal: The MF units must be regularly backwashed to remove the filtrate and maintain their performance. The proposed backwash handling and disposal approach has been developed to maximize recovery and recycling of spent backwash water through the WTP, thereby minimizing the need to discharge to the sewer and/or pump and haul-off backwash solids. The packaged MF units would backwash approximately every 60 minutes as solids build up on the surface of the membrane fibers. Coagulant may be added to the spent backwash water, which would then be sent to an equalization tank to dissipate energy, and the spent backwash water would settle in an underground fiberglass backwash settling tank. The settled spent backwash water would be decanted off from inside the backwash settling tank and would be pumped at a low rate through a bag or cartridge filter solids treatment process. The treated backwash water would be pre-disinfected and returned to just upstream of the MF system. Periodically the settled solids in the backwash settling tank would be pumped out and disposed offsite.

Treated Water Storage, Pumping and Distribution: The WTP would include a partially-buried, reinforced concrete clearwell for equalization/operational storage to provide for intermittent operations of the membrane plant and some limited

backwash water supply for the membrane filters. The size of the clearwell for Phase I is currently estimated to be 7,000 gallons, which would provide 10 minutes of operational volume. The clearwell would be expanded to about 14,000 gallons (current estimate) for Phase II.

A treated water pump station would be constructed to pump the treated water from the clearwell into the existing water distribution system. The pump station would include vertical turbine pumps within the treatment plant building. It is currently estimated that two 650 gpm, 100-horsepower pumps would be provided for Phase I, and a third pump (same size) would be added for Phase II. The motors would be equipped with variable frequency drives to allow the pump station to meet multiple demand conditions. Approximate 100 to 300 feet of new 12-inch underground water main would be constructed between the WTP building and the existing distribution system to make the connection.

In addition, the following existing distribution system improvements would be required at each of the three WTP site locations being considered:

- Lodge Road WTP Site:
    - Phase I – Replace approximately 600 linear feet of existing 6-inch water main with new 12-inch water main.
    - Phase II – Replace another approximately 2,900 linear feet of existing 6-inch water main with new 12-inch water main.
- Chamberland Drive WTP Site:
    - Phase I – Replace approximately 600 linear feet of existing 6-inch water main with new 12-inch water main.
    - Phase II – Replace another approximately 2,900 linear feet of existing 6-inch water main with new 12-inch water main.
- Lagoon Road WTP Site:
    - Phase I – Replace approximately 2,900 linear feet of existing 4- and 6-inch water main with new 12-inch water main.
    - Phase II – Replace another approximately 300 linear feet of existing 6-inch water main with new 12-inch water main.

Operations and Maintenance (O&M)

The O&M requirements for the WLRWTP facilities would increase the TCPUD staff duties from the current winter well-only operation, but they would be relatively similar to the current summer ISWTP operation. A summary of the significant changes in the O&M with the new WLTRWTP system from current operations are:

- Adequate continuous monitoring and controls would be in place to allow the TCPUD to operate the intake pump station and WTP site remotely or onsite.
- TCPUD staff time spent on the backwash operation would increase, requiring approximately 100 hours per year of additional staff time.
- Typical TCPUD staff operations would include checking the operation of the Lake Intake Pump station and WTP five days per week for about one hour per day with another one hour per day to conduct maintenance on pumps, valves, and equipment, running tests to confirm treatment process performances, and replacing spent backwash bags.
- About twice per year, TCPUD staff would pump out the backwash holding tank and transport the solids offsite for disposal. This would require use of the TCPUD's vactor truck.
- Once every 60 to 120 days the TCPUD would receive delivery of chemicals, sodium hypochlorite, clean in place chemicals, and coagulant via a flatbed truck delivering the chemicals to the intake electrical/chemical room and the WTP site.
- Once per month, TCPUD staff would need to operate the standby generator to confirm it is operational.
- The WTP electricity use with MF and UV would increase significantly. The annual electrical use of the pump intake and WTP is estimated at 369,000 kw-hours at Phase I 650 gpm WTP capacity, compared to the current lake intake, interim WTP and well at 114,000 kw-hours for a 300 gpm WTP capacity. The annual electrical use of the pump intake and WTP for Phase II at 1,100 gpm is 462,000 kw-hours per year.
- The lake intake submersible pumps would be inspected annually.

Potential Public Parking Lot and Restroom

If the WLTRWTP is located at either the Lodge or Chamberland sites, the project could be expanded to include a public parking lot and restroom in order to improve public access to the adjacent and nearby recreational facilities including the west shore bike path and the Chambers Landing public beach. The public parking lot would include approximately 25 parking spaces and the public restroom would include two restrooms (men's and women's) consisting of one toilet and one sink each (4 fixtures total). The public restrooms would be connected to the TCPUD's public water and sewer system. Figures 11 and 12 show the possible configurations of these facilities at the two different sites.

Proposed Site Plans

In total, there are five options being considered for the layout of the building and other site improvements within the project site:

- the Chamberland Site layout without a parking lot shown in Figure 8,
- the Lodge Site layout without a parking lot in Figure 9,
- the Lagoon site in Figure 10,
- the Chamberland Site layout with a parking lot in Figure 11,
- the Lodge Site layout with a parking lot in Figure 12

FIGURES

DUDEK

7788

SOURCE: ESRI 2015

FIGURE 1
Regional Map

TCPUD West Lake Tahoe Regional Water Treatment Plant

DUDEK

7788

SOURCE: USGS 7.5-Minute Series Homewood Quadrangle.

FIGURE 2
Vicinity Map

TCPUD West Lake Tahoe Regional Water Treatment Plant

DUDEK

7788

SOURCE: Kennedy/Jenks Consultants 2014; Placer County 2011; Bing Maps 2015

FIGURE 3

Aerial Map - Lodge WTP Site

TCPUD West Lake Tahoe Regional Water Treatment Plant

DUDEK

7788

SOURCE: Kennedy/Jenks Consultants 2014; Placer County 2011; Bing Maps 2015

FIGURE 4

Aerial Map - Chamberland WTP Site

TCPUD West Lake Tahoe Regional Water Treatment Plant

DUDEK

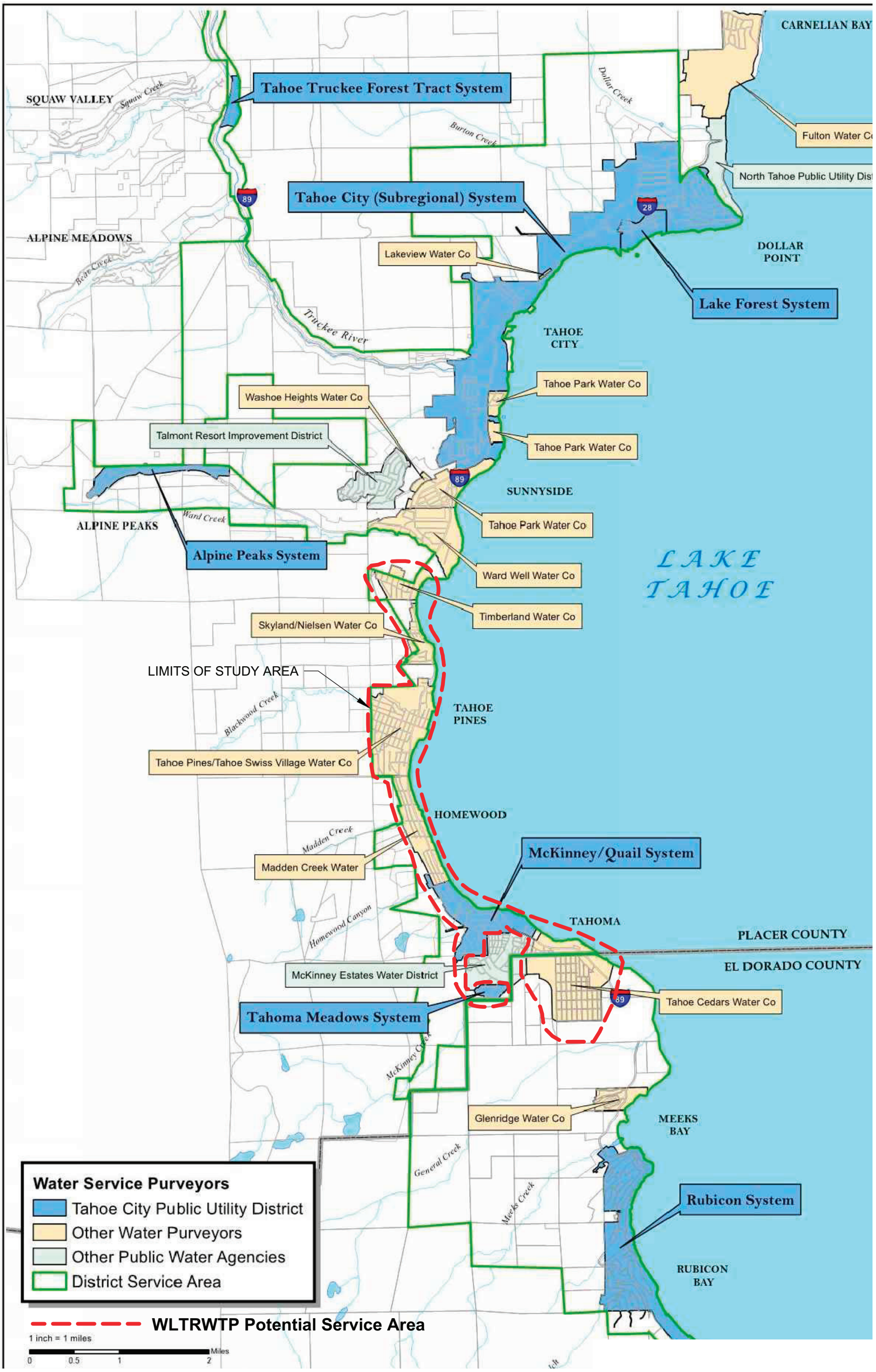
7788

SOURCE: Kennedy/Jenks Consultants 2014; Placer County 2011; Bing Maps 2015

FIGURE 5

Aerial Map - Lagoon WTP Site

TCPUD West Lake Tahoe Regional Water Treatment Plant



SOURCE: Preliminary Design Report - Kennedy/Jenks Consultants 2014

DUDEK

7788

FIGURE 6

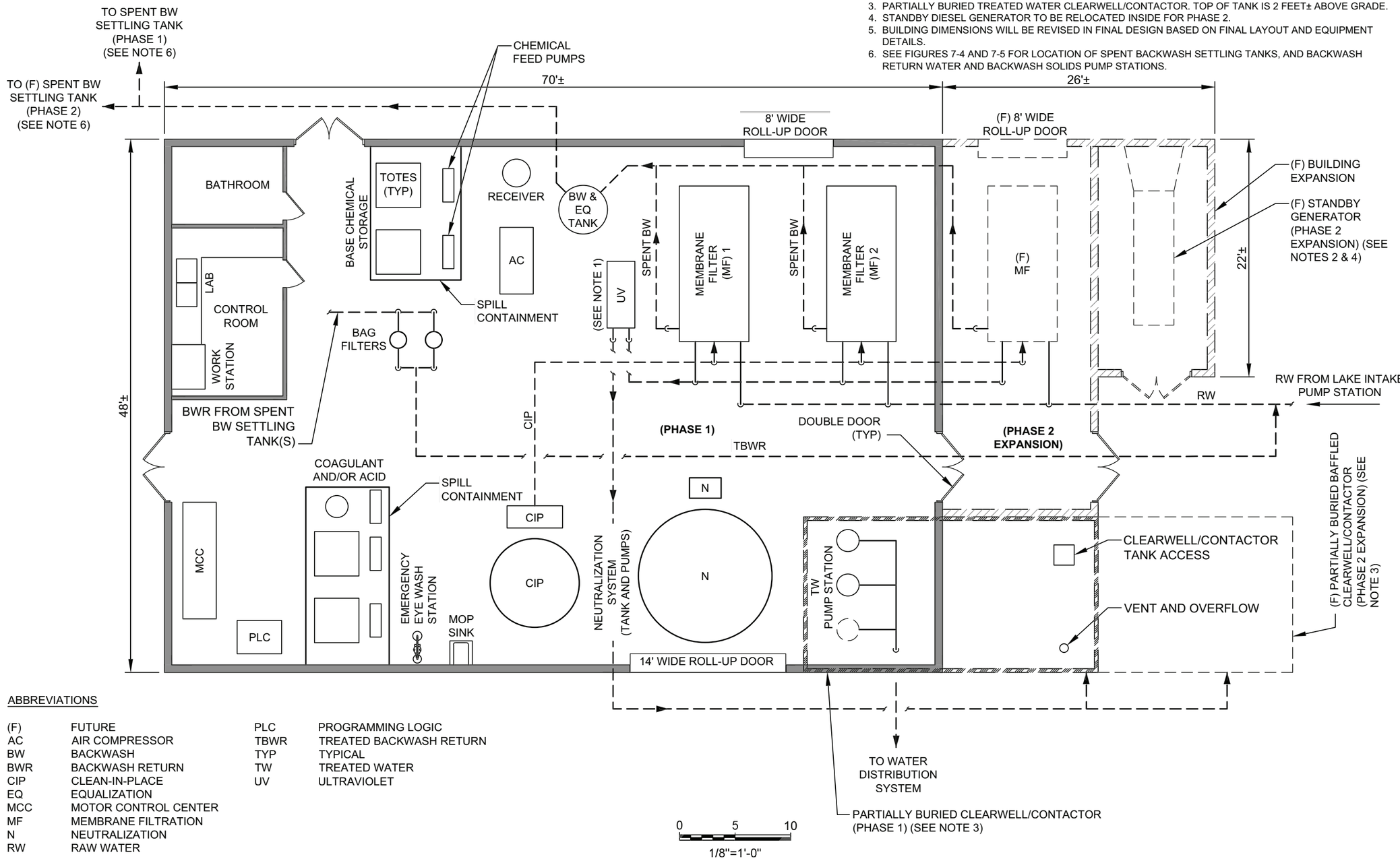
Service Areas for Water Systems

TCPUD West Lake Tahoe Regional Water Treatment Plant

Z:\Projects\

NOTES:

1. STACKABLE UV (MIN / PH1 - 2 UV UNITS AND PH 2 - 3RD UV UNIT).
2. STANDBY GENERATOR LOCATED OUTSIDE BUILDING AT (F) MF SPACE IN PHASE 1.
3. PARTIALLY BURIED TREATED WATER CLEARWELL/CONTACTOR. TOP OF TANK IS 2 FEET± ABOVE GRADE.
4. STANDBY DIESEL GENERATOR TO BE RELOCATED INSIDE FOR PHASE 2.
5. BUILDING DIMENSIONS WILL BE REVISED IN FINAL DESIGN BASED ON FINAL LAYOUT AND EQUIPMENT DETAILS.
6. SEE FIGURES 7-4 AND 7-5 FOR LOCATION OF SPENT BACKWASH SETTLING TANKS, AND BACKWASH RETURN WATER AND BACKWASH SOLIDS PUMP STATIONS.



ABBREVIATIONS

(F)	FUTURE	PLC	PROGRAMMING LOGIC
AC	AIR COMPRESSOR	TBWR	TREATED BACKWASH RETURN
BW	BACKWASH	TYP	TYPICAL
BWR	BACKWASH RETURN	TW	TREATED WATER
CIP	CLEAN-IN-PLACE	UV	ULTRAVIOLET
EQ	EQUALIZATION		
MCC	MOTOR CONTROL CENTER		
MF	MEMBRANE FILTRATION		
N	NEUTRALIZATION		
RW	RAW WATER		

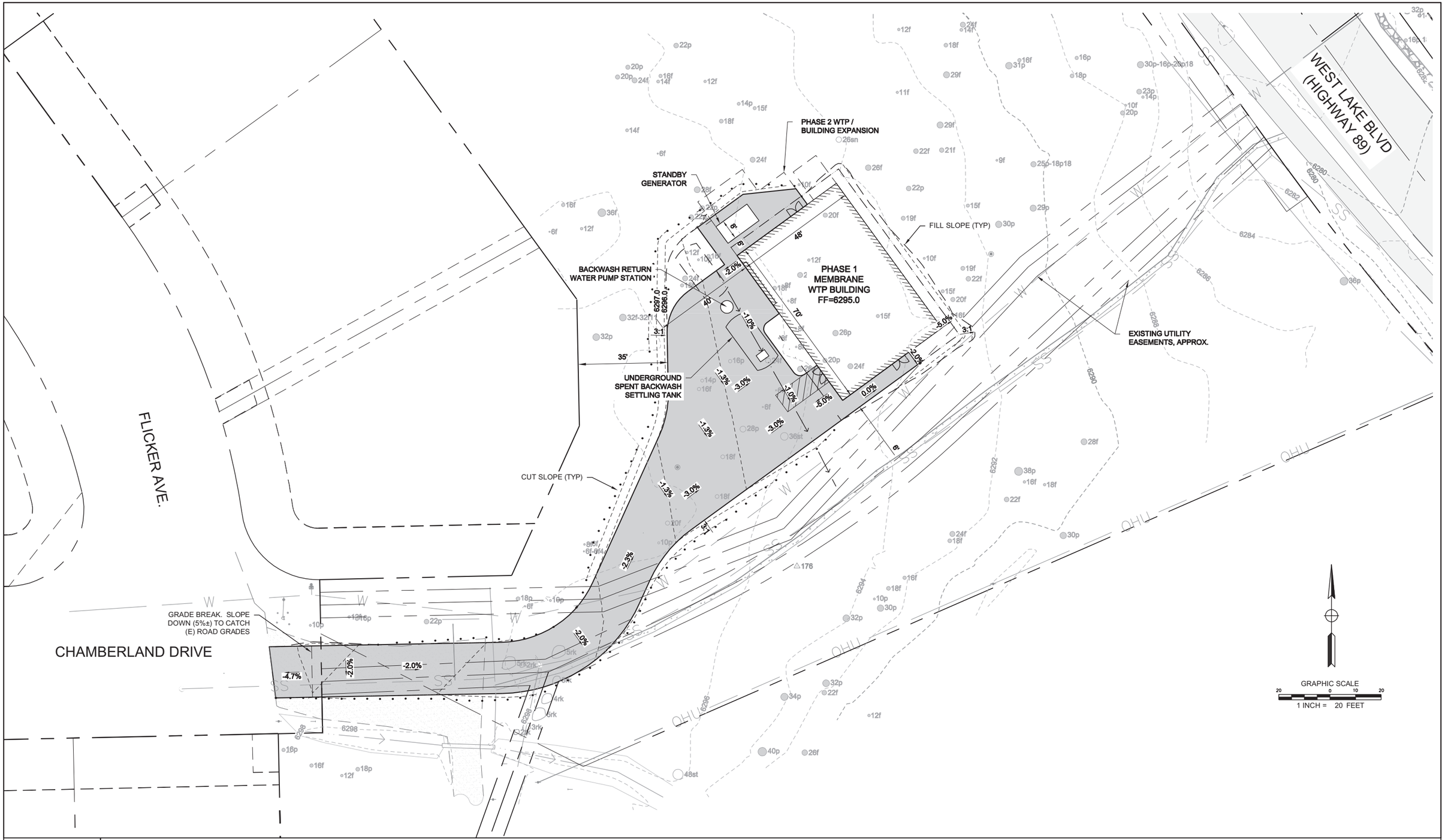
DUDEK

7778

SOURCE: Preliminary Design Report - Kennedy/Jenks Consultants 2015

FIGURE 7
Conceptual Floor Plan

TCPUD West Lake Tahoe Regional Water Treatment Plant



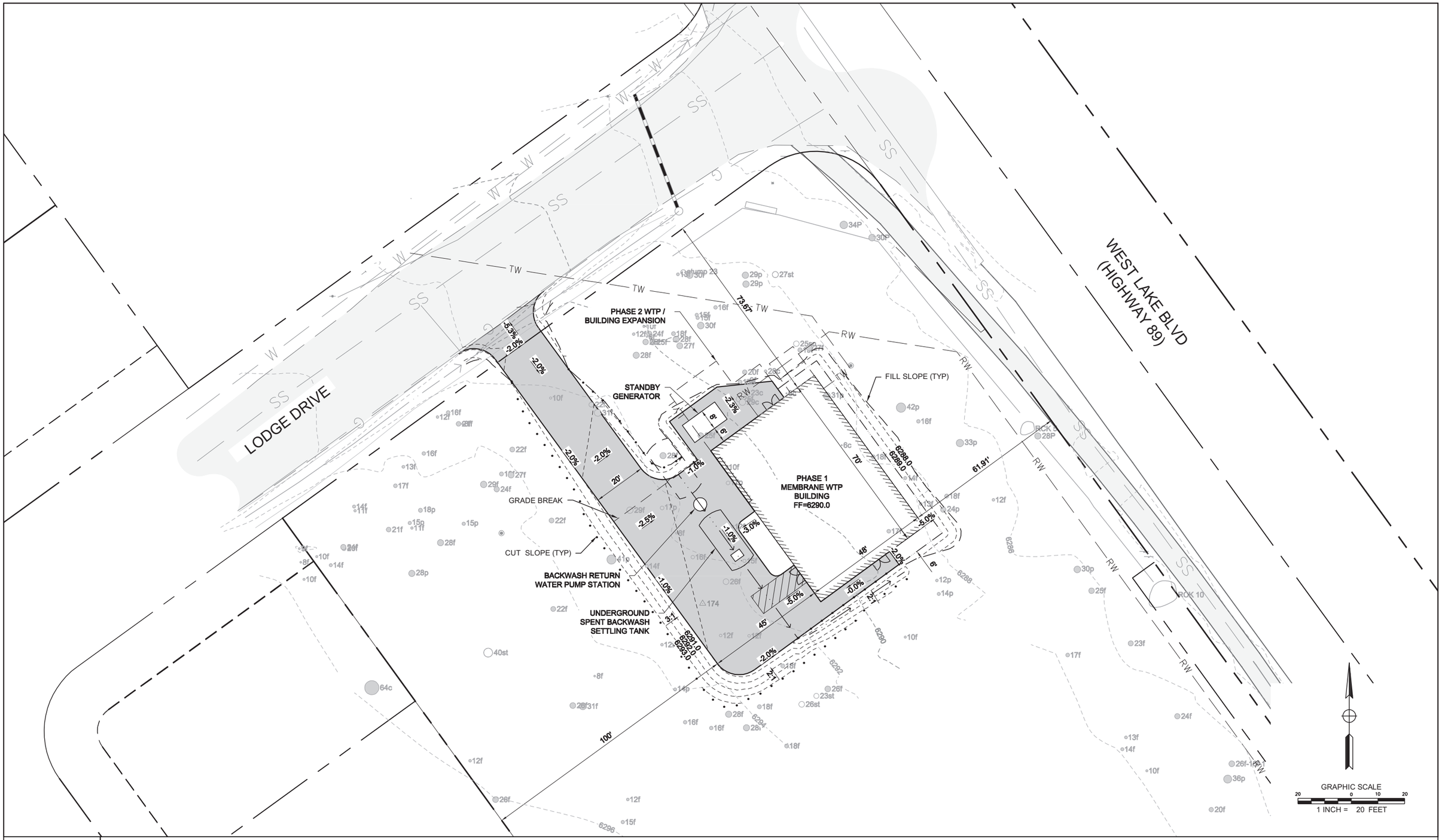
DUDEK

7778

SOURCE: Preliminary Design Report - Kennedy/Jenks Consultants 2014

FIGURE 8
Chamberland Site without Parking Lot Layout

TCPUD West Lake Tahoe Regional Water Treatment Plant



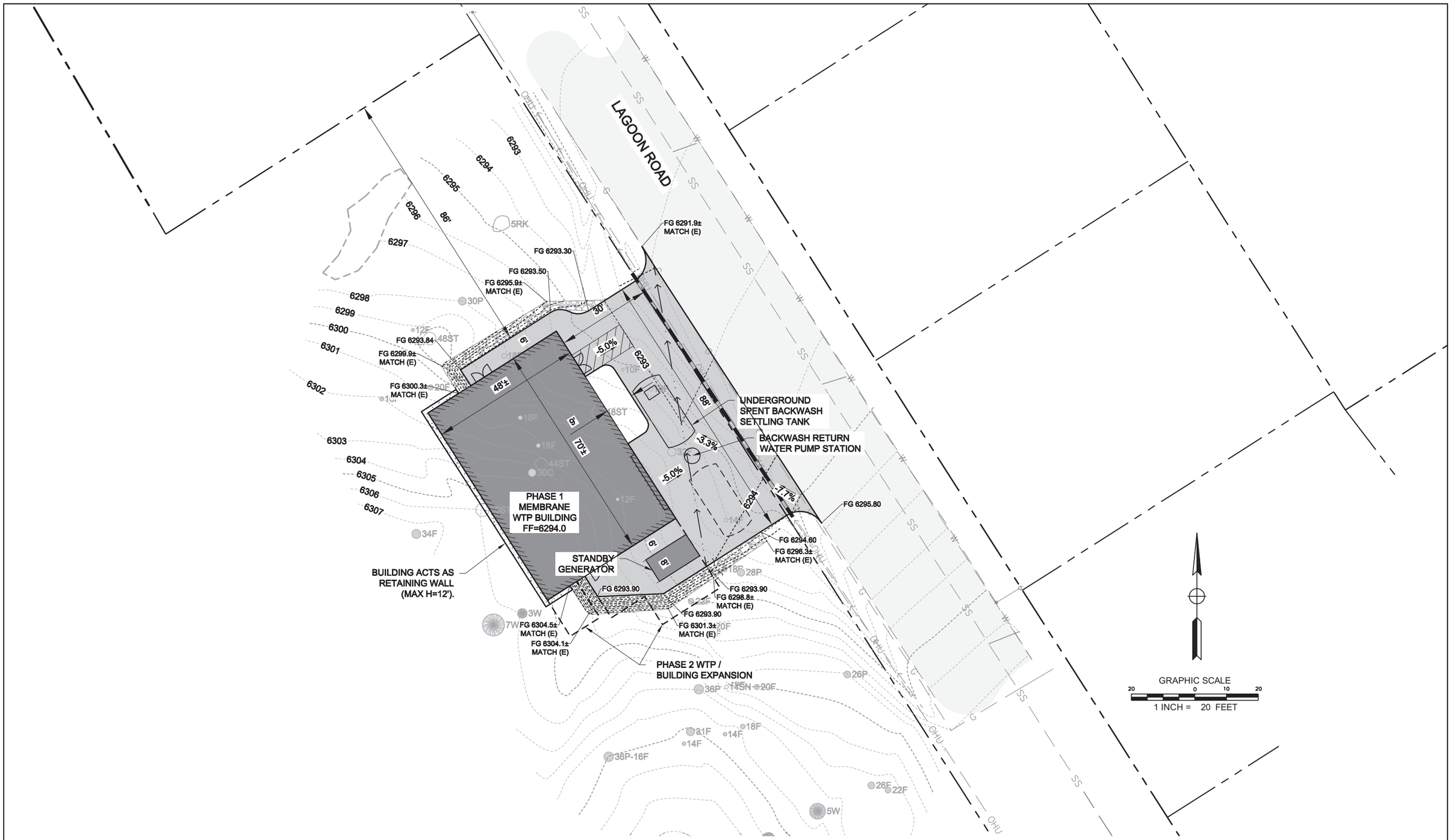
DUDEK

7778

SOURCE: Preliminary Design Report - Kennedy/Jenks Consultants 2014

FIGURE 9
Lodge Site without Parking Lot Layout

TCPUD West Lake Tahoe Regional Water Treatment Plant



DUDEK

7778

SOURCE: Preliminary Design Report - Kennedy/Jenks Consultants 2015

FIGURE 10
Lagoon Site Layout

TCPUD West Lake Tahoe Regional Water Treatment Plant

SOURCE: Preliminary Design Report - Kennedy/Jenks Consultants 2015

DUDEK

7778

FIGURE 11

Chamberland Site with Parking Lot Layout

TCPUD West Lake Tahoe Regional Water Treatment Plant

DUDEK

7778

SOURCE: Preliminary Design Report - Kennedy/Jenks Consultants 2015

FIGURE 12

Lodge Site with Parking Lot Layout

TCPUD West Lake Tahoe Regional Water Treatment Plant