

# Final consolidation data set analysis

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## Overview of consolidations 2015-2021

In 2015 there were 7,642 Public Water Systems (PWSs) in the state, 3,015 of which were Community Water Systems (CWS) (2015 Safe Drinking Water Plan). Today, the state counts 7,351 PWS with 2,870 CWS. Some of this reduction can be attributed to system consolidations. Compiling various state data sources we have identified 185 consolidation projects between 2015 and 2016.

These consolidations have taken place in nearly every county (47 total) and involve the water providers of an estimated 11420338 Californians. Of them, 131511 have been incorporated as customers into a new water system as part of a consolidation project, in other words, were previously served by a *consolidated* system.

Of the 185 cases we identify, 23 were managerial consolidations, another 162 were physical consolidations. Our data set consists of only 2 mandatory consolidations (Pratt MWC and Ceres West MHP) with the remainder being voluntary consolidations.

Among the 180 water systems physical consolidated, the mean distance between these systems and the service boundary of the system to which they were connected was 0.904 miles, the median distance was 0.179. The minimum distance was 0 miles (ie already in the service boundaries) and the maximum was 17.85 miles.

Only considering the 82 physically consolidated CWS the mean distance between these systems and the service boundary of the system to which they were connected was 1.061 miles, the median distance was 0.174

## Drivers of consolidation

The SWRCB has publicly available information on factors driving or incentivizing consolidation in 187 of the consolidated water systems in our dataset. Grouping this descriptive information into categories, we find that water quality concerns are by far the most common reason for consolidation (100 cases). Table 1 below provides frequencies for all five categories, none indicates that no driving factors or issues were listed. “Sustainability” in turn indicates that the reasons given were pro-active, e.g., reliance on a single source. Capacity indicates source capacity whereas TMF capacity indicates technical, managerial and financial capacity.

	#
Capacity	5
Disaster	8
Multiple	13
None	51
Quality	100
Sustainability	3
TMF Capacity	7

	#
Capacity	5

	#
Disaster	8
Multiple	13
None	46
Quality	95
Sustainability	3
TMF Capacity	6

	#
Capacity	0
Disaster	0
Multiple	0
None	5
Quality	5
Sustainability	0
TMF Capacity	1

### Characteristics of all consolidated systems

As preciously mentioned, 131511 Californians were served by a water system that was consolidated between January 2015 and December 2021. The mean population served by one of these systems is 638 with a minimum of 0 (as listed in SDWIS data) and maximum of 17503. The median population served, however, is 120 indicating that the vast majority of consolidated systems are very small.

The 185 consolidation projects studied here resulted in the inactivation of approximately 203 Public Water Systems between 2015 and 2016. 108 of these systems were Community Water Systems (CWS). The remainder are a mix of NC and NTNC systems. Further we identify 1 consolidation of a state small water systems and 2 instances of consolidating domestic well communities.

184 of these systems relied on groundwater as their primary source, another 22 relied on surface water.

These systems, in turn, represent 17 different institutional/governing types (See Dobbin & Fencel 2021). These types can be furthered grouped into 8 The most common type is Private ancillary systems. The second most common type is public ancillary systems. See table below and see appendix for more detailed institutional type distribution.

Governance Category	Freq
Private ancillary	102
Public ancillary	31
IOU	22
nonprofit private	14
General purpose government	13
Special district	13
Private - unknown	9
Other	2

### Characteristics of consolidated Community Water Systems

Among just the consolidated systems that were CWSs, these statistics are as follows.

Count	Population_mean	Population_median	Population_min	Population_max
111	988.8829	150	0	17503

95 of the consolidated CWS relied on groundwater as their primary source, another 16 relied on surface water.

These systems, in turn, represent 15 different institutional/governing types (See Dobbin & Fencel 2021) also spanning 8. The most common governance type is Private Ancillary systems followed by IOUs and private nonprofit systems.

Institutional_Type	Freq
MHP	27
IOU	21
Private (other)	21
MWC	14
CSA	7
CSD	4
County Water District	3
City	2
Domestic wells	2
Federal	2
MWD	2
State	2
Water District	2
ID	1
School	1

Governance Category	Freq
Private ancillary	40
IOU	21
nonprofit private	14
Special district	12
General purpose government	9
Private - unknown	8
Public ancillary	5
Other	2

## Characteristics of receiving water systems

Among the 143 unique receiving water systems, 87 rely on groundwater as their primary source, another 55 rely on surface water. 133 of these systems are community water systems.

20 of these systems participated in more than one consolidation project over the study period. 2 systems participated in 6 consolidation projects each over the course of the 6 years. Another system, South Tahoe PUD, participated in 9.

## Characteristics of only systems “receiving” CWSs in consolidations

Among the systems that were receiving systems in the above cases of CWS consolidation, we find similar diversity in institutional types, IOUs are the most common receiving system type and City’s the second most common. Overall, 13 different institutional types acted as receiving systems over the studied period spanning

5. See appendix for the break down of institutional types and governance categories for all receiving systems not just those receiving CWS.

```
## Rows: 143 Columns: 2

## -- Column specification -----
## Delimiter: ","
## chr (2): Receiving_System_ID, Category

##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.

## Joining, by = "Receiving_System_ID"
```

Governance Category	Freq
IOU	33
Special district	29
General purpose government	22
nonprofit private	2
Public ancillary	2

```
## Joining, by = "Receiving_System_ID"
```

Institutional Type	Freq
IOU	33
City	21
County Water District	7
CSD	6
PUD	5
Special Act District	4
Water District	3
Irrigation District	2
MWC	2
MWD	2
CSA	1
School	1
State	1

## Governance change as a result of CWS consolidations

Using this information about consolidated and receiving system types, then, we are able to identify how CWS governance is changing in the state as a result of consolidations. In total, CWS consolidations represent 23 distinct governance changes, the five most common of which are displayed in the table below.

Change from, to	#
IOU , IOU	18
Private ancillary , General purpose government	16
Private ancillary , Special district	16
Special district , Special district	10
Private ancillary , IOU	7

## Demographic comparison between consolidated CWS and receiving systems

The demographic make up of community water systems (inclusive of private well and SSWS) consolidated during the study period are described below based on the census block group of the system area

var	min	mean	median	max	sd
MHI.consolidated	13974.00	62010.58	54667.00	250001.00	36695.05
Percent.asian.consolidated	0.00	6.71	1.07	79.94	14.68
Percent.black.consolidated	0.00	2.20	0.05	30.83	4.99
Percent.hispanicorlatino.consolidated	0.00	33.64	24.63	99.28	28.64
Percent.native.consolidated	0.00	0.53	0.00	7.29	1.39
Percent.PI.consolidated	0.00	0.22	0.00	17.89	1.74
Percent.renter.consolidated	0.00	36.83	34.08	100.00	22.36
Percent.white.consolidated	0.72	53.38	56.24	100.00	29.68

The demographic make up water system that “received” consolidated community water systems (inclusive of private well and SSWS) consolidated during the study period are described below based on an areal interpolation of the demographics of the system boundaries based on census block groups

var	min	mean	median	max	sd
MHI.receiving	26364.55	72832.07	65603.14	172724.42	32559.12
Percent.asian.receiving	0.00	5.24	2.78	54.78	8.14
Percent.black.receiving	0.00	2.39	0.82	18.61	3.87
Percent.hispanicorlatino.consolidated	0.00	33.64	24.63	99.28	28.64
Percent.native.receiving	0.00	0.71	0.23	18.41	2.03
Percent.PI.receiving	0.00	0.23	0.01	7.03	0.74
Percent.renter.receiving	3.12	38.45	39.35	98.68	18.26
Percent.white.receiving	5.79	52.95	53.52	100.00	26.52

Looking at these consolidations individually, there is little to no clear trends

var	min	mean	median	max	sd
dif.MHI	-77276.58	7967.32	332.52	70746.17	29462.14
dif.renter	-79.92	1.20	0.12	55.50	20.73
dif.white	-47.72	0.78	0.05	55.81	17.29

## Appendix

**Institutional types and governance category for all consolidated water systems (not just CWS):**

Consolidated_Inst_Type	Freq
Private (other)	80
MHP	31
IOU	22
School	20
MWC	14
CSA	7
State	7
City	4
CSD	4

Consolidated_Inst_Type	Freq
Federal	4
County Water District	3
County (other)	2
Domestic wells	2
MWD	2
Water District	2
ID	1
Recreation and park district	1

Governance Category	Freq
Private ancillary	102
Public ancillary	31
IOU	22
nonprofit private	14
General purpose government	13
Special district	13
Private - unknown	9
Other	2

**Institutional types and governance types for all receiving water systems (not just those receiving CWS systems):**

Institutional_Type	Freq
City	39
IOU	37
County Water District	12
CSD	9
Irrigation District	6
PUD	6
Special Act District	6
MWC	5
CSA	3
MWD	3
Private (other)	3
State	3
Water District	3
PA	2
School	2
Federal	1
JPA	1
RCD	1
Tribal	1

Governance Category	Freq
Special district	47
General purpose government	42
IOU	37

Governance Category	Freq
nonprofit private	7
Public ancillary	6
Private ancillary	3
Other	1

**Top ten governance change pathways for all consolidations cases (not just CWS)**

Change from, to	#
Private (other) , City	38
IOU , IOU	18
Private (other) , IOU	12
MHP , City	11
Private (other) , PUD	8
MHP , CSD	7
MHP , IOU	5
MWC , City	5
City , City	4
CSA , County Water District	4
MWC , IOU	4
Private (other) , County Water District	4
Private (other) , CSD	4
State , State	4

**gov change institutional types for all consolidations**

Change from, to	#
Private ancillary , General purpose government	46
Private ancillary , Special district	35
IOU , IOU	18
Private ancillary , IOU	15
Public ancillary , Special district	12