



**DEPARTMENT OF THE NAVY**  
NAVAL AIR WEAPONS STATION CHINA LAKE  
1 ADMINISTRATION CIRCLE  
CHINA LAKE, CA 93555-6100

IN REPLY REFER TO:  
5800  
June 17, 2019

Board of Directors  
Indian Wells Valley Groundwater Authority (IWVGA)  
Ridgecrest, CA 93555

Dear Members of the Board:

This letter serves to formally respond to requests from you, your Policy Advisory Committee, and your Technical Advisory Committee for data regarding the Navy's personnel and historic water use in the Indian Wells Valley. This data is provided to assist you in developing a Groundwater Sustainability Plan (GSP), as required by the Sustainable Groundwater Management Act (SGMA). Requests include the amount of water needed to sustain the Navy's current and future mission on Naval Air Weapons Station China Lake (NAWSCL), the Navy workforce (military, civilians, contractors, and dependents) at the installation, and data regarding the Navy's historic water consumption.

In November 2018, the Navy provided a figure of 2,041 acre-feet per year as the amount of water the installation could agree to use under a GSP. Be advised, however, that the Navy's Federal Reserve Water Right (FRWR) is not limited to 2,041 acre-feet per year. The Navy's FRWR dates back to the establishment of the base in 1943, and as you are well aware, SGMA does not impact FRWRs. The Navy's actual FRWR would likely be established through litigation, which the Navy hopes to avoid by having all pumpers in the Basin agree to an allocated amount.

Enclosure (1) contains data that should assist you as you formulate the GSP, including the Navy's workforce trends and Navy water production. The information contained in enclosure (1) is provided for planning purposes only and, again, does not constitute the Navy's FRWR.

The Navy appreciates the IWVGA's effort in implementing SGMA. Our ability to recruit and retain talented personnel at NAWSCL is tied to our workforce's ability to access economically viable potable water. Water sustainability is critical to NAWSCL's mission accomplishment.

  
P. M. DALE  
Captain, U.S. Navy  
Commanding Officer

Enclosures: 1. Navy Demographics and Water Requirements at Naval Air Weapons Station (NAWS), China Lake, CA



**Navy Demographics and Water Requirements  
at Naval Air Weapons Station (NAWS),  
China Lake, CA**

by  
Matthew L. Boggs  
*NAVAIR Ranges*

**MAY 2019**

**NAVAL AIR WARFARE CENTER WEAPONS DIVISION  
CHINA LAKE, CA 93555-6100**



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# Naval Air Warfare Center Weapons Division

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## FOREWORD

This report analyzes the historic workforce demographics trends of the Navy mission at China Lake, CA for the period 1945 through 2017, and relates these trends to corresponding requirements for water. This analysis quantifies the effects of maturization of the Navy affiliated workforce through the rapid development of the China Lake community and technical mission, as well as the divestment of community from Navy ownership to private ownership in the adjoining City of Ridgecrest and unincorporated areas. Through this analysis, clear trends were seen—a persistent mission and workforce, punctuated by the mission affiliated surges and reductions associated with the conflicts, and peacetime of the period.

The work of this report was conducted as part of the Naval Air Warfare Center Weapons Division (NAWCWD) Range Sustainment Office's continuing efforts to define and mitigate potential mission encroachment impacts to the NAWCWD China Lake Research, Development, Test, and Evaluation (RDT&E) mission.

This report was reviewed by J. E. Walters, M. G. Finnell, and S. A. Bork.

Approved by  
T. DOWD, *Director*  
NAVAIR Ranges  
23 May 2019

Under authority of  
W. S. DILLON  
RDML, U.S. Navy  
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## 1.0 BACKGROUND

In 1943, the U.S. Navy developed the largest consolidated facility for weapons and armament research, development, test, and evaluation (RDT&E), located in the sparsely populated upper Mojave Desert at China Lake, CA. At the time of the Station's founding in 1943, it was estimated that the Indian Wells Valley had a population smaller than 200 (Reference 1). This facility combines the Navy's largest RDT&E laboratory complex with the Navy's largest RDT&E range to allow for rapid development and test of weapon systems used by the Navy as well as all services and allied nations. Due to its remote location, the Navy was required to develop facilities capable of attracting national-class scientists and engineers to fulfill its mission, resulting effectively in a defense-oriented "company town" similar to specialized, peer facilities and communities such as Los Alamos, NM. Unlike many of these other World War II (WWII) defense "company boom towns," the Navy planned China Lake from the start for permanence, developing its facilities with master plans developed by the architecture and engineering firm of Stafford, Davies, and Gogerty, one of the leading firms of the Los Angeles area known for their mid-century modern designs. Today, the personnel and dependents of the Navy mission no longer live on board the base as they did for the first three decades following establishment, although the tie between mission and staff and community remains as tightly coupled as ever.

### 1.1 MISSION AND COMMUNITY GROUNDWATER RELIANCE

As expected in this desert locale, no surface water is locally available as a water supply for the Navy and surrounding community. At the time that the area opened under the Homestead Act in the early 20th Century, plans were proposed to divert surface water from the Owens River located to the north in Inyo County. The proposition put forth by the Bureau of Reclamation aimed to develop desert lands for agricultural use primarily in the Owens Valley, but also in the Indian Wells Valley. These proposals were not realized, with the water of the Owens River instead diverted to Los Angeles in the 1910s via the Los Angeles Aqueduct built between 1908 and 1913 (References 2 and 3). Upon the Navy's arrival at China Lake in 1943, it was clear that the Navy would need a reliable source of water to supply its newly formed research facilities and corresponding community. To address this need, the Navy developed a water system supplied by wells tapping into the Indian Wells Valley aquifer, though an emergency connection to the Los Angeles Aqueduct was also developed (but abandoned in the 1970s) (Reference 4). As the population shifted from on board the Navy base to the adjoining Ridgecrest area, groundwater sources on the civil side were developed and offset the gradual reduction of Navy water pumping.

2.0 NAVY WORKFORCE TRENDS

The Navy affiliated population demonstrates a largely stable trend since 1943, though it has experienced periodic growth and downsizing, typically associated with major military conflicts. The most extreme of these downsizings followed the end of the Cold War, which resulted in a large shedding of personnel and the start of a nearly decade-long hiring freeze. The general trend of China Lake has demonstrated a net growth and consolidation in mission to China Lake, rather than a trend of divestment, as seen in Figure 1.

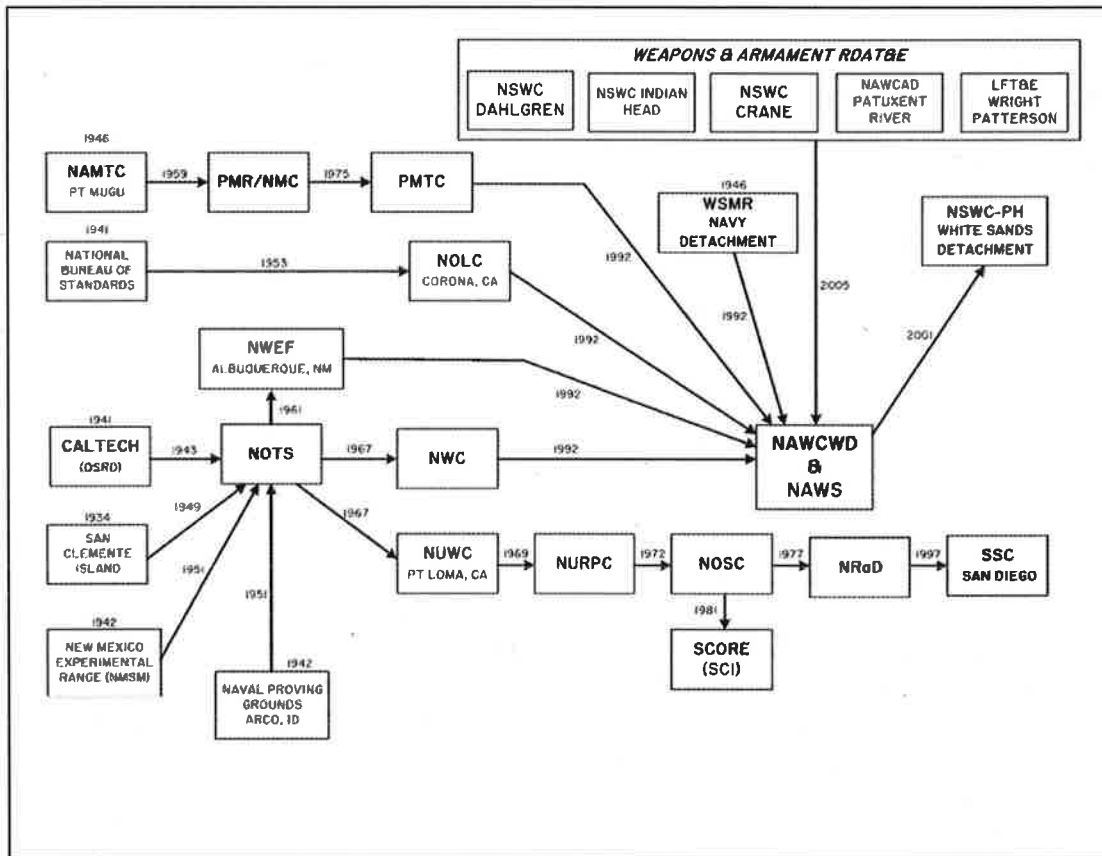


FIGURE 1. China Lake Organization, Consolidation, and Divestures.

The generally stable and permanent nature of the Navy workforce at China Lake is depicted in Figure 2. The role of dependents in Navy demographics represents the unique nature of the Navy mission at China Lake where a community is maintained to attract and retain scientific and engineering staff that would not otherwise be found at such a remote location. The stable nature of the scientific and engineering staff results in a corresponding trend in its dependents, often reflecting the mass hiring of staff, followed by the establishment and maturization of family units. A change in trend is seen associated with the staff divestment and hiring freeze of the 1990s, whereupon the level of dependents reduces as families mature and dependent children leave home, and are not offset by incoming younger families associated with the long hiring freeze of this period.

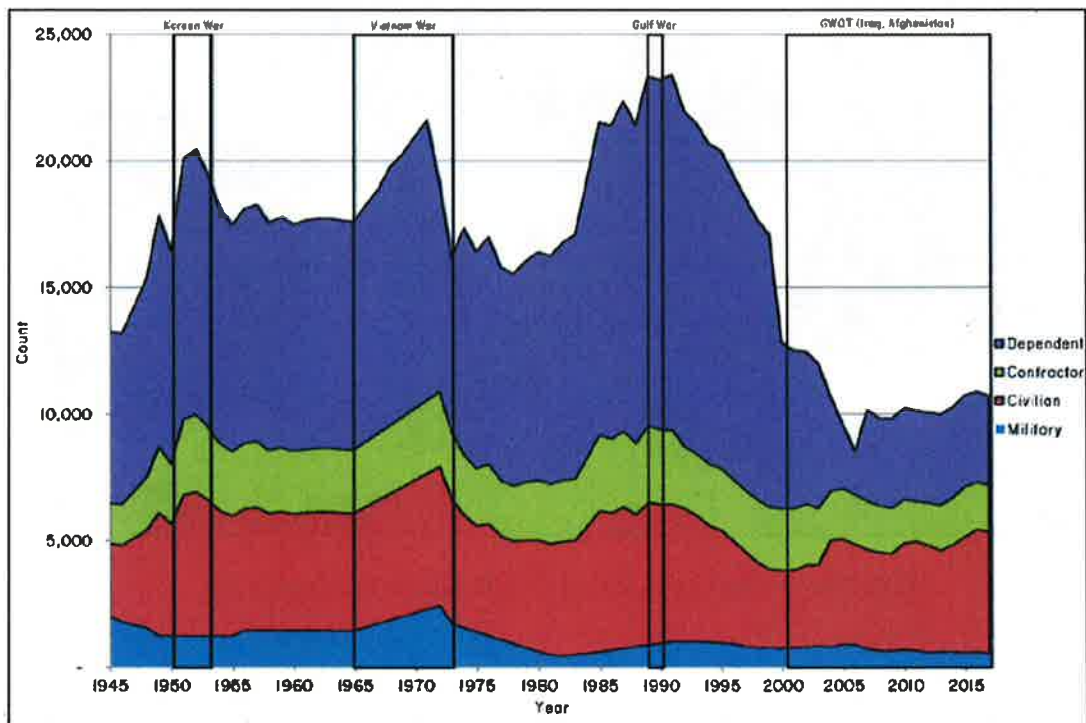


FIGURE 2. Navy Workforce and Dependents 1945 Through 2017.

### 3.0 CHANGE IN NAVY COMMUNITY

The first three decades of the Navy at China Lake were characterized by a Navy owned and built community infrastructure for both the military and civilian staff and dependents. This is consistent with the wartime experience that built new government boomtowns where nothing had been before. The Navy formally defined China Lake as a permanent facility in 1968 (Reference 5), enabling the underwriting of home loans by the Federal Housing Administration. This formal definition acted as a major event in the Navy's long

term plans dating to 1963 to divest itself of managing a community in support of China Lake. Unlike Department of Energy (DOE) laboratories at venues such as Los Alamos, NM, in the case of China Lake, this resulted in an exodus from the base and a surge in private ownership within Ridgecrest and the surrounding unincorporated areas. Subsequently, Navy housing was demolished, as seen in Figure 3. In contrast, the DOE at Los Alamos chose not to divest its community via exodus, but instead simply redefined its boundaries and privatized its existing community infrastructure (Reference 6).



FIGURE 3. 1982 Demolition of 500 Navy Housing Units.

The result of this divestiture is clear. Following the 1968 Navy “statement of permanence,” coupled with strategic divestitures of 116.77 acres of Navy property in 1970 to spur the development of Ridgecrest, the population shift occurs rapidly. In contrast to a community that included 2,916 family dwelling units in 1972 (Reference 1), the China Lake on-base community consists of only 192 family units at the present time. This exodus of staff housing represents a simple shift from government owned housing to private ownership. This shift also represents a change where the Navy staff and dependents receive their water supply. Whereas the Navy population previously relied on the Navy water infrastructure, upon moving to Ridgecrest or the unincorporated areas of the Indian Wells Valley, the population now began to rely upon civil or private water sources. This led to increased diversity of water sources to include the Indian Wells Valley Water District (IWVWD), small mutual water companies, and private wells. In all cases, these non-Navy water supply sources still rely on groundwater from the Indian Wells Valley aquifer.

#### 4.0 NAVY WATER PRODUCTION TRENDS

The Navy developed water system acted as the dominant water supply system for the Indian Wells Valley's population in the post-WWII period, driven by the Navy's development at China Lake. This Navy water system increased production from inception until 1970, with a maximum annual production volume of 7,988 acre-feet. Following the 1970 peak, the Navy water production reduces as the Navy staff moves off-Station to Ridgecrest and the unincorporated areas of Indian Wells Valley. Additional water use reductions are currently taking place on the Naval Air Weapons Station (NAWS) through conservation measures to include removal of irrigated landscapes in favor of xeriscaping and the removal of some artificial landscaping entirely. These production trends are presented in Figure 4.



FIGURE 4. Navy Water Production: 1945 Through 2016.

## 5.0 NAVY AFFILIATED WATER REQUIREMENTS

Given the move of the Navy staff and dependents off-Station, water requirements of the Navy cannot be determined solely by the Navy's recent direct production amounts. Modern Navy production amounts only reflect the water volume required by the industrial aspect of the mission and the requirements of the remaining military residences on Station. Since the Navy mission at China Lake requires its workforce, the full Navy water requirements are the combination of the on-Station requirements and those of the Navy workforce and their dependents off-Station. Historic staffing trends of the Navy workforce can inform these requirements with a long trend baseline.

As a proxy for direct measurement of the total Navy staff and dependent water usage, total usage may be calculated as a product of the Navy demographics and the California Department of Water Resources (DWR) values for per capita water use for the Indian Wells Valley Water District (Reference 7), the largest civil supplier of domestic water for Navy staff and dependents. The resulting plot of calculated Navy staff and the dependent water requirement is shown in Figure 5. This calculation does apply modern consumption values (including the effects of modern water conservation efforts) to the historic staffing trend, resulting in a lower value of staff and dependent water consumption than probably realized at the time. As shown in Figure 5, the peak water use by Navy staff and dependents was 4,562 acre-feet in 1990, and the average use by Navy staff and dependents from 1945 to the present is 3,228 acre-feet per year.

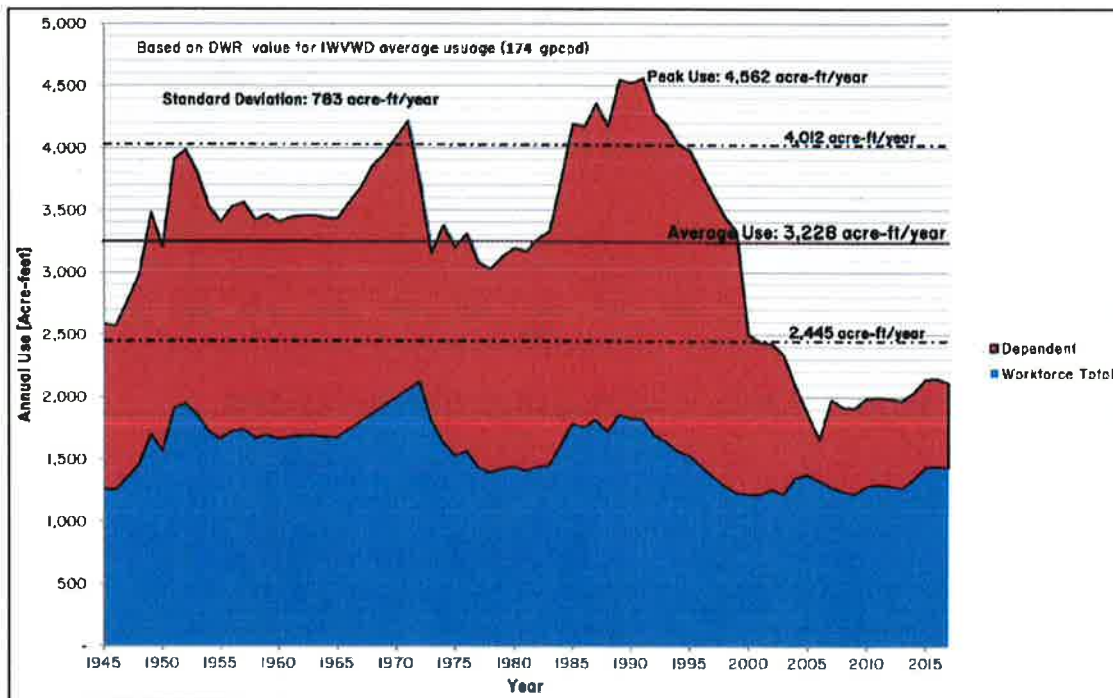


FIGURE 5. Workforce and Dependent Water Consumption.

As a major component of the Navy water requirements for China Lake, workforce and dependent consumption must be added to the water requirements associated with the industrial aspects of NAWS. The industrial component can be calculated by subtracting the on-center housing consumption from the total production values; using fiscal year (FY) 2017 values, this indicates an annual Navy industrial water requirement of 1,213 acre-ft. This value must be added to the Navy staff and dependent requirements to yield a total Navy requirement value. This yields a peak water use by Navy of 5,775 acre-feet in 1990, and an average use from 1945 to the present of 4,441 acre-feet per year. Since fluctuations in requirements are expected in response to changes in military demand in war and peace as seen in the historic data, Navy requirements can be determined by applying the standard staffing data's standard deviation (783 acre feet per year) to the average values, yielding a baseline requirement of 5,224 acre-feet per year.

## 6.0 SUMMARY OF NAVY WATER REQUIREMENTS

Based on the analysis described in Section 5.0, Navy annual water requirements are presented in Table 1, noted as "Baseline" values. Referencing the China Lake 2016 Legislative Environmental Impact Statement (Reference 8), a 25% growth in the Navy mission should be analyzed as well. This results in a baseline annual Navy water requirement at China Lake of 5,224 acre-feet, with a potential growth requirement of 6,530 acre-feet.

TABLE 1. NAWS Total Annual Water Requirements.

	Baseline, acre-ft	25% Growth Over Baseline, acre-ft
Navy Requirements	5,224	6,530

## 7.0 REFERENCES

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**8.0 ACRONYMS**

CALTECH	California Institute of Technology
DOE	Department of Energy
DWR	California Department of Water Resources
FY	fiscal year
gpcpd	gallons per capita per day
IWVCGMG	Indian Wells Valley Cooperative Groundwater Management Group
NAMTC	Naval Air Missile Test Center
NAWS	Naval Air Weapons Station
NCCOSC	Naval Command, Control and Ocean Surveillance Center
NM	New Mexico
NMSM	New Mexico School of Mines
NOLC	Naval Ordnance Laboratory, Corona
NOSC	Naval Ocean Systems Center
NOTS	Naval Ordnance Test Station
NRaD	RDT&E Division
NSWC	Naval Surface Warfare Center
NSWC-PH	Naval Surface Warfare Center Port Hueneme Detachment
NUWC	Naval Underwater Weapons Center
NWC	Naval Weapons Center
NWEF	Naval Weapons Evaluation Facility
OSRD	Office of Scientific Research & Development
PMR/NMC	Pacific Missile Range/Naval Missile Center
PMTC	Pacific Missile Test Center
RDT&E	Research, Development, Test, and Evaluation
WSMR	White Sands Missile Range
WWII	World War II

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**Appendix A**  
**CHINA LAKE NAVY STAFFING DATA**

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	1945	1946	1947	1948	1949	1950	1951	1952	1953
<b>Military</b>	1,987 <sup>18</sup>	1,798 <sup>3</sup>	1,657 <sup>3</sup>	1,551 <sup>3</sup>	1,232 <sup>4</sup>	1,232 <sup>4</sup>	1,232 <sup>4</sup>	1,232 <sup>4</sup>	1,232 <sup>4</sup>
<b>Civilian</b>	2,915 <sup>17</sup>	3,018 <sup>17</sup>	3,442 <sup>17</sup>	3,857 <sup>17</sup>	4,864 <sup>17</sup>	4,417 <sup>17</sup>	5,568 <sup>17</sup>	5,687 <sup>17</sup>	5,384 <sup>17</sup>
<b>Contractor</b>	1,573 <sup>1</sup>	1,628 <sup>1</sup>	1,857 <sup>1</sup>	2,081 <sup>1</sup>	2,624 <sup>1</sup>	2,283 <sup>1</sup>	3,004 <sup>1</sup>	3,068 <sup>1</sup>	2,905 <sup>1</sup>
<b>Dependent</b>	6,784 <sup>2</sup>	6,753 <sup>2</sup>	7,288 <sup>2</sup>	7,847 <sup>2</sup>	9,137 <sup>2</sup>	8,416 <sup>2</sup>	10,273 <sup>2</sup>	10,465 <sup>2</sup>	9,976 <sup>2</sup>
<b>Total</b>	13,259	13,197	14,244	15,335	17,858	16,448	20,077	20,452	19,497

	1954	1955	1956	1957	1958	1959	1960	1961	1962
<b>Military</b>	1,232 <sup>4</sup>	1,232 <sup>4</sup>	1,447 <sup>5</sup>	1,447 <sup>5</sup>	1,447 <sup>5</sup>	1,447 <sup>5</sup>	1,447 <sup>5</sup>	1,447 <sup>5</sup>	1,447 <sup>5</sup>
<b>Civilian</b>	4,938 <sup>17</sup>	4,745 <sup>17</sup>	4,805 <sup>17</sup>	4,857 <sup>17</sup>	4,630 <sup>17</sup>	4,700 <sup>16</sup>	4,608 <sup>16</sup>	4,660 <sup>16</sup>	4,681 <sup>16</sup>
<b>Contractor</b>	2,664 <sup>1</sup>	2,560 <sup>1</sup>	2,592 <sup>1</sup>	2,620 <sup>1</sup>	2,498 <sup>1</sup>	2,536 <sup>1</sup>	2,486 <sup>1</sup>	2,514 <sup>1</sup>	2,525 <sup>1</sup>
<b>Dependent</b>	9,257 <sup>2</sup>	8,945 <sup>2</sup>	9,267 <sup>2</sup>	9,351 <sup>2</sup>	8,985 <sup>2</sup>	9,909 <sup>2</sup>	8,950 <sup>2</sup>	9,034 <sup>2</sup>	9,067 <sup>2</sup>
<b>Total</b>	18,091	17,482	18,112	18,276	17,560	17,781	17,491	17,655	17,721

	1963	1964	1965	1966	1967	1968	1969	1970	1971
<b>Military</b>	1,447 <sup>5</sup>	1,417 <sup>19</sup>	1,440 <sup>19</sup>	1,502 <sup>6</sup>	1,563 <sup>6</sup>	1,625 <sup>6</sup>	1,686 <sup>6</sup>	1,933 <sup>6</sup>	2,179 <sup>6</sup>
<b>Civilian</b>	4,687 <sup>16</sup>	4,675 <sup>16</sup>	4,650 <sup>16</sup>	4,732 <sup>6</sup>	4,814 <sup>6</sup>	4,896 <sup>6</sup>	4,978 <sup>6</sup>	4,428	4,962 <sup>7</sup>
<b>Contractor</b>	2,529 <sup>1</sup>	2,522 <sup>1</sup>	2,509 <sup>1</sup>	2,553 <sup>1</sup>	2,597 <sup>1</sup>	2,641 <sup>1</sup>	2,686 <sup>1</sup>	2,389 <sup>1</sup>	2,677 <sup>1</sup>
<b>Dependent</b>	9,077 <sup>2</sup>	9,010 <sup>2</sup>	9,010 <sup>2</sup>	9,207 <sup>2</sup>	9,343 <sup>2</sup>	9,771 <sup>2</sup>	9,797 <sup>2</sup>	9,168 <sup>2</sup>	10,288 <sup>2</sup>
<b>Total</b>	17,740	17,641	17,609	17,993	18,317	18,933	19,147	17,917	20,105

	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Military</b>	2,425 <sup>20</sup>	1,704 <sup>21</sup>	1,547 <sup>8</sup>	1,389 <sup>8</sup>	1,232 <sup>8</sup>	1,075 <sup>8</sup>	918 <sup>8</sup>	760 <sup>8</sup>	603 <sup>16</sup>
<b>Civilian</b>	5,496 <sup>20</sup>	4,924 <sup>21</sup>	4,446 <sup>16</sup>	4,196 <sup>16</sup>	4,415 <sup>16</sup>	4,089 <sup>16</sup>	4,057 <sup>16</sup>	4,257 <sup>16</sup>	4,408 <sup>16</sup>
<b>Contractor</b>	2,965 <sup>1</sup>	2,657 <sup>1</sup>	2,399 <sup>1</sup>	2,264 <sup>1</sup>	2,382 <sup>1</sup>	2,206 <sup>1</sup>	2,189 <sup>1</sup>	2,297 <sup>1</sup>	2,378 <sup>1</sup>
<b>Dependent</b>	8,300 <sup>20</sup>	6,900 <sup>21</sup>	8,949 <sup>2</sup>	8,570 <sup>2</sup>	8,971 <sup>2</sup>	8,422 <sup>2</sup>	8,368 <sup>2</sup>	8,730 <sup>2</sup>	9,007 <sup>2</sup>
<b>Total</b>	19,186	16,185	17,340	16,420	17,000	15,792	15,531	16,044	16,397

	1981	1982	1983	1984	1985	1986	1987	1988	1989
<b>Military</b>	487 <sup>16</sup>	444 <sup>16</sup>	499 <sup>16</sup>	537 <sup>16</sup>	604 <sup>9</sup>	672 <sup>9</sup>	739 <sup>9</sup>	806 <sup>9</sup>	873 <sup>9</sup>
<b>Civilian</b>	4,386 <sup>16</sup>	4,512 <sup>16</sup>	4,511 <sup>16</sup>	5,038 <sup>16</sup>	5,566 <sup>1616</sup>	5,426 <sup>11</sup>	5,582 <sup>11</sup>	5,222 <sup>11</sup>	5,627 <sup>11</sup>
<b>Contractor</b>	2,366 <sup>1</sup>	2,434 <sup>1</sup>	2,434 <sup>1</sup>	2,718 <sup>1</sup>	3,003 <sup>1</sup>	2,927 <sup>1</sup>	3,012 <sup>1</sup>	2,817 <sup>1</sup>	3,036 <sup>1</sup>
<b>Dependent</b>	9,009 <sup>2</sup>	9,385 <sup>2</sup>	9,642 <sup>2</sup>	10,953 <sup>2</sup>	12,348 <sup>2</sup>	12,927 <sup>2</sup>	13,037 <sup>2</sup>	12,582 <sup>2</sup>	13,807 <sup>2</sup>
<b>Total</b>	16,248	16,775	17,085	19,246	21,521	21,403	22,369	21,427	23,343

	1990	1991	1992	1993	1994	1995	1996	1997	1998
<b>Military</b>	941 <sup>9</sup>	1,008 <sup>10</sup>	1,001 <sup>10</sup>	1,006 <sup>10</sup>	982 <sup>10</sup>	954 <sup>10</sup>	917 <sup>10</sup>	807 <sup>10</sup>	770 <sup>10</sup>
<b>Civilian</b>	5,486 <sup>11</sup>	5,430 <sup>11</sup>	5,250 <sup>11</sup>	4,969 <sup>11</sup>	4,602 <sup>11</sup>	4,448 <sup>11</sup>	4,049 <sup>11</sup>	3,741 <sup>11</sup>	3,348 <sup>11</sup>
<b>Contractor</b>	2,960 <sup>1</sup>	2,929 <sup>1</sup>	2,448 <sup>11</sup>	2,448 <sup>11</sup>	2,448 <sup>11</sup>	2,448 <sup>11</sup>	2,448 <sup>11</sup>	2,448 <sup>11</sup>	2,448 <sup>11</sup>
<b>Dependent</b>	13,829 <sup>2</sup>	14,039 <sup>2</sup>	13,258 <sup>2</sup>	13,052 <sup>2</sup>	12,650 <sup>2</sup>	12,563 <sup>2</sup>	12,054 <sup>2</sup>	11,552 <sup>2</sup>	11,076 <sup>2</sup>
<b>Total</b>	23,215	23,406	21,957	21,475	20,413	20,413	19,468	18,548	17,682

	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Military</b>	756 <sup>10</sup>	750 <sup>10</sup>	768 <sup>10</sup>	784 <sup>10</sup>	830 <sup>10</sup>	787 <sup>10</sup>	898 <sup>10</sup>	880 <sup>10</sup>	708 <sup>10</sup>
<b>Civilian</b>	3,106 <sup>11</sup>	3,061 <sup>11</sup>	3,051 <sup>11</sup>	3,238 <sup>11</sup>	3,209 <sup>11</sup>	4,221 <sup>11</sup>	4,152 <sup>11</sup>	3,961 <sup>11</sup>	3,926 <sup>13</sup>
<b>Contractor</b>	2,464 <sup>11</sup>	2,443 <sup>11</sup>	2,438 <sup>11</sup>	2,430 <sup>11</sup>	2,224 <sup>11</sup>	1,935 <sup>11</sup>	2,009 <sup>11</sup>	1,976 <sup>11</sup>	1,916 <sup>14</sup>
<b>Dependent</b>	10,767 <sup>2</sup>	6,583 <sup>12</sup>	6,262 <sup>12</sup>	6,011 <sup>12</sup>	5,735 <sup>12</sup>	3,750 <sup>12</sup>	2,533 <sup>12</sup>	1,709 <sup>12</sup>	3,605 <sup>12</sup>
<b>Total</b>	17,093	12,837	12,519	12,463	11,998	10,693	9,592	8,526	10,154

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Military</b>	637 <sup>10</sup>	627 <sup>10</sup>	678 <sup>10</sup>	636 <sup>10</sup>	567 <sup>10</sup>	591 <sup>10</sup>	597 <sup>10</sup>	565 <sup>10</sup>	587 <sup>10</sup>	538 <sup>10</sup>
<b>Civilian</b>	3,890 <sup>13</sup>	3,855	4,204 <sup>15</sup>	4,324 <sup>15</sup>	4,226 <sup>15</sup>	4,008 <sup>15</sup>	4,221 <sup>15</sup>	4,571 <sup>15</sup>	4,850 <sup>15</sup>	4,785 <sup>15</sup>
<b>Contractor</b>	1,855 <sup>14</sup>	1,795	1,734 <sup>15</sup>	1,580 <sup>15</sup>	1,687 <sup>15</sup>	1,792 <sup>15</sup>	1,871 <sup>15</sup>	1,987 <sup>15</sup>	1,860 <sup>15</sup>	1,879 <sup>15</sup>
<b>Dependent</b>	3,457 <sup>12</sup>	3,537 <sup>12</sup>	3,618 <sup>12</sup>	3,584 <sup>12</sup>	3,574 <sup>12</sup>	3,596 <sup>12</sup>	3,579 <sup>12</sup>	3,610 <sup>12</sup>	3,592 <sup>12</sup>	3,500 <sup>12</sup>
<b>Total</b>	9,840	9,814	10,205	10,247	10,184	10,117	10,445	10,984	11,009	10,859

## Notes:

- 1) Based on average contractor to civilian ratio, 1992-2017.
- 2) Based on 1972 dependent to military/civilian ratio.
- 3) Linear interpolation between 1945 and 1949 values.
- 4) Based on 1956 numbers minus VX-5 count.
- 5) Plus-up from arrival of VX-5; based on 1964 count.
- 6) Linear interpolation between 1965 and 1972 values.
- 7) Linear interpolation between 1970 and 1972 values.
- 8) Linear interpolation between 1973 and 1980 values.
- 9) Linear interpolation between 1984 and 1991 values.
- 10) Defense Manpower Data Center Reporting System (DMDCRS), "Active Duty Family Sponsors & Eligible Dependents Report by Base."
- 11) Naval Air Warfare Center (NAWC) Human Resources (HR) Data.
- 12) Department of Defense (DoD) Dependent Data: DoD Population in Zip Codes 93527 and 93555 By Year, Person Type Code, and Personnel Category Code, Source: *DEERS Point in Time Extract*.
- 13) Linear interpolation between 2006 and 2009 values.
- 14) Linear interpolation between 2006 and 2010 values.
- 15) Naval Air Weapons Station (NAWS) demographic data.
- 16) Naval Ordnance Test Station (NOTS)/Naval Weapons Center (NWC) annual command histories.
- 17) Figure 1-4, *NOTS Technical Program Review 1958*.
- 18) "NOTS 20 Years," *Rocketeer*, 8 Nov 1963.
- 19) "Capt. Hardy Tells NOTS' Impact on Kern Economy," *Rocketeer*, 15 Jan 1965.
- 20) *1972 Installation Survey Report*, Naval Weapons Center, China Lake, California. Naval Inspector General, Office of the Chief of Naval Operations. 6 October 1972.
- 21) *1973 Installation Survey Report*, Naval Weapons Center, China Lake, California. Naval Inspector General, Office of the Chief of Naval Operations. 1 November 1973.

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**Appendix B**

**CHINA LAKE STAFF AND DEPENDENT WATER REQUIREMENT DATA**

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China Lake Staff and Dependent Water Requirement Data, based on 2018 Department of Water Resources (DWR) value of 176 gallons per capita per day (gpcpd) for the Indian Wells Valley Water District (IWVWD).

**China Lake Staff and Dependent Water Requirements (acre-ft).**

	1945	1946	1947	1948	1949	1950	1951	1952	1953
<b>Military</b>	387	350	323	302	240	240	240	240	240
<b>Civilian</b>	568	588	671	752	948	861	1,085	1,108	1,049
<b>Contractor</b>	307	317	362	406	511	464	585	598	566
<b>Dependent</b>	1,322	1,316	1,421	1,529	1,781	1,640	2,002	2,040	1,944
<b>Total</b>	2,584	2,572	2,776	2,989	3,481	3,206	3,913	3,986	3,800

	1954	1955	1956	1957	1958	1959	1960	1961	1962
<b>Military</b>	240	240	282	282	282	282	282	282	282
<b>Civilian</b>	962	925	937	947	902	916	898	908	912
<b>Contractor</b>	519	499	505	511	487	494	485	490	492
<b>Dependent</b>	1,804	1,744	1,806	1,823	1,751	1,773	1,744	1,761	1,767
<b>Total</b>	3,526	3,407	3,530	3,562	3,423	3,466	3,409	3,441	3,454

	1963	1964	1965	1966	1967	1968	1969	1970	1971
<b>Military</b>	282	276	281	308	336	363	390	418	445
<b>Civilian</b>	914	911	906	930	953	977	1,001	1,024	1,048
<b>Contractor</b>	493	492	489	502	514	527	540	552	565
<b>Dependent</b>	1,769	1,759	1,756	1,823	1,877	1,991	2,023	2,090	2,157
<b>Total</b>	3,458	3,438	3,432	3,562	3,681	3,858	3,954	4,084	4,215

	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Military</b>	473	332	301	271	240	209	179	148	118
<b>Civilian</b>	1,071	960	867	818	861	797	791	830	859
<b>Contractor</b>	578	518	468	441	464	430	427	448	464
<b>Dependent</b>	1,618	1,345	1,744	1,670	1,748	1,641	1,631	1,701	1,756
<b>Total</b>	3,739	3,154	3,380	3,200	3,313	3,078	3,027	3,127	3,196

	1981	1982	1983	1984	1985	1986	1987	1988	1989
<b>Military</b>	95	87	97	105	118	131	144	157	170
<b>Civilian</b>	855	879	879	982	1,085	1,058	1,088	1,018	1,097
<b>Contractor</b>	461	474	474	530	585	571	587	549	592
<b>Dependent</b>	1,756	1,829	1,879	2,135	2,407	2,413	2,541	2,452	2,691
<b>Total</b>	3,167	3,269	3,330	3,751	4,195	4,172	4,360	4,176	4,550

	1990	1991	1992	1993	1994	1995	1996	1997	1998
<b>Military</b>	183	196	195	196	191	186	179	157	150
<b>Civilian</b>	1,069	1,058	1,023	968	897	867	789	729	653
<b>Contractor</b>	577	571	477	477	477	477	477	477	485
<b>Dependent</b>	2,695	2,736	2,584	2,544	2,466	2,449	2,349	2,252	2,159
<b>Total</b>	4,525	4,562	4,280	4,186	4,031	3,979	3,794	3,615	3,446

	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Military</b>	147	146	150	153	162	153	175	172	138
<b>Civilian</b>	605	597	595	631	625	823	809	772	765
<b>Contractor</b>	480	476	475	474	433	377	392	385	373
<b>Dependent</b>	2,099	1,283	1,220	1,172	1,118	731	494	333	703
<b>Total</b>	3,332	2,502	2,440	2,429	2,338	2,084	1,869	1,662	1,979

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Military</b>	124	122	132	124	111	115	116	110	114	105
<b>Civilian</b>	758	751	819	843	824	781	823	891	945	933
<b>Contractor</b>	362	350	338	308	329	349	365	387	363	366
<b>Dependent</b>	674	689	705	699	697	701	698	704	700	682
<b>Total</b>	1,918	1,913	1,989	1,997	1,985	1,972	2,036	2,141	2,146	2,116

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**Appendix C**  
**NAVY WATER PRODUCTION DATA**

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## Navy Water Production (acre-ft).

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Volume	709 <sup>1</sup>	1,620 <sup>1</sup>	1,847 <sup>1</sup>	2,139 <sup>1</sup>	2,768 <sup>1</sup>	3,265 <sup>1</sup>	3,839 <sup>1</sup>	4,201 <sup>1</sup>	4,533 <sup>1</sup>	4,892 <sup>1</sup>	5,236 <sup>1</sup>	5,561 <sup>1</sup>	5,923 <sup>1</sup>	5,782 <sup>1</sup>

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Volume	6,141 <sup>1</sup>	6,211	6,316 <sup>1</sup>	6,709 <sup>1</sup>	6,521 <sup>1</sup>	7,022 <sup>1</sup>	6,933 <sup>1</sup>	7,126 <sup>1</sup>	6,917 <sup>1</sup>	7,381 <sup>1</sup>	7,663 <sup>1</sup>	7,988 <sup>1</sup>	7,967 <sup>1</sup>	7,872 <sup>1</sup>

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Volume	7,392 <sup>2</sup>	7,395 <sup>2</sup>	6,492 <sup>2</sup>	6,494 <sup>2</sup>	5,410 <sup>2</sup>	5,413 <sup>2</sup>	5,154 <sup>3</sup>	4,995 <sup>3</sup>	4,804 <sup>3</sup>	4,450 <sup>3</sup>	4,402 <sup>3</sup>	4,694 <sup>3</sup>	4,002 <sup>3</sup>	4,430 <sup>3</sup>

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Volume	4,422 <sup>3</sup>	3,980 <sup>3</sup>	4,205 <sup>3</sup>	3,667 <sup>3</sup>	3,364 <sup>3</sup>	3,351 <sup>3</sup>	3,411 <sup>3</sup>	3,684 <sup>3</sup>	3,848 <sup>3</sup>	3,367 <sup>3</sup>	2,983 <sup>3</sup>	3,018 <sup>3</sup>	2,541 <sup>3</sup>	2,690 <sup>3</sup>

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Volume	2,840 <sup>3</sup>	3,138 <sup>3</sup>	3,325 <sup>3</sup>	2,331 <sup>3</sup>	2,288 <sup>3</sup>	2,440 <sup>3</sup>	2,533 <sup>3</sup>	2,119 <sup>3</sup>	1,883 <sup>3</sup>	1,710 <sup>3</sup>	1,734 <sup>3</sup>	1,710 <sup>3</sup>	1,588 <sup>4</sup>	1,607 <sup>4</sup>

	2015	2016	2017
Volume	1,421 <sup>4</sup>	1,595 <sup>4</sup>	1,450 <sup>4</sup>

## Notes:

- 1) Naval Ordnance Test Station (NOTS)/Naval Weapons Center (NWC) data.
- 2) From Figure 6 Berenbrock & Martin.<sup>\*</sup> Digitized from plot.
- 3) As reported to the Indian Wells Valley Cooperative Groundwater Management Group (IWVCGMG).
- 4) Naval Air Weapons Station (NAWS) data.

<sup>\*</sup>C. Berenbrock and P. Martin. 1991. *The Ground Water Flow System in the Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, California*. USGS Water Resources Investigations Report 89-4191.

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