# Appendix M

Appendix M - Supplemental Data for C2VSimFG-Kern Model

M1 - Supporting Water Budget Tables C2VSimFG-Kern Model

M2 - Validation and Performance Assessment C2VSimFG-Kern Model

M3 - Hydrographs of Groundwater Elevations Projected-Future
Kern County Subbasin

# APPENDIX M1

# Supporting Water Budget Tables

# C2VSimFG-Kern Model

**TABLE 1 - Summary of C2VSimFG-Beta modifications in the Kern County Revision applied to C2VSimFG-Kern by IWFM model input file**

| File Name | Change to Model Input File |
|---|---|
| **C2VSimFG.in** | |
| * | Change simulation starting time to 09/30/1985_24:00 |
| **C2VSimFG_Unsat.dat** | |
| * | Replaced initial condition values with more representative values for revised starting |
| **C2VSimFG_SWatersheds.dat** | |
| * | Modified parameters to improve stream discharge match to historical values |
| **C2VSimFG_Groundwater1985.dat** | |
| * | Added hydrologic flow barrier at White Wolf Fault |
| * | Set Corcoran Clay thickness to 0 ft in areas where it is not present |
| * | New 10/1/1985 initial condition |
| * | Modified hydraulic conductivity and specific storage in Layer 1 in the Kern Water Bank |
| * | Kern County observation wells |
| **C2VSimFG_ElemPump.dat** | |
| * | FRACSK and DSTSK modified for Kern County elements with limited pumping |
| **C2VSimFG_WellSpec.dat** | |
| * | Added Kern County groundwater water bank recovery wells |
| * | Added Kern County In-District and Urban wells |
| **C2VSimFG_PumpRates.dat** | |
| * | Added Kern County groundwater water bank recovery pumping |
| * | Added Kern County In-District and Urban pumping |
| **C2VSimFG_StreamInflow.dat** | |
| * | Exteneded Poso Creek inflow through WY2015 |
| **C2VSimFG_DiverionSpec.dat** | |
| * | Removed all Kern County diversions and renumbered remaining diversions to 1-371 |
| * | Added Kern County diersions 372-484 |
| **C2VSimFG_Diverions.dat** | |
| * | Removed all Kern County diversions and renumbered remaining diversions to 1-371 |
| * | Added Kern County diersions 372-484 |
| * | Updated diversion data for all diversions to Kern County |
| **C2VSimFG_BypassSpecs.dat** | |
| * | Removed bypass #17 |
| **C2VSimFG_RootZone.dat** | |
| * | Native return flow is sent to either nearby stream nodes as runoff or out-of-model as ET |
| **C2VSimFG_IrrPeriod.dat** | |
| * | Adjusted Kern County irrigation periods |
| **C2VSimFG_ReturnFlowFrac.dat** | |
| * | Modified Kern County Ag return flow fraction |
| **C2VSimFG_Urban.dat** | |
| * | Added zone 106 for Metro Bakersfield and adjusted other Kern County zone areas |
| * | Applied estimated September 1985 initial condition |

**TABLE 1 - Summary of C2VSimFG-Beta modifications in the Kern County Revision applied to C2VSimFG-Kern by IWFM model input file**

| File Name | Change to Model Input File |
|---|---|
| **C2VSimFG_Urban_Area.dat** | |
| * | Changed Kern County oil fields from urban to native vegetation |
| **C2VSimFG_Urban_PerCapWaterUse.dat** | |
| * | Updated population for Kern County Urban Zones based on 1990, 2000, 2010 Census |
| * | Developed demands from historical data and water management plans |
| **C2VSimFG_Urban_Population.dat** | |
| * | Updated population for Kern County Urban Zones based on 1990, 2000, 2010 Census |
| **C2VSimFG_Urban_WaterUseSpecs.dat** | |
| * | Set fractions for SRs 19-21 based on local info |
| **C2VSimFG_NonPondedCrop.dat** | |
| * | Return flow = 0 for Kern County |
| **C2VSimFG_NonPondedCrop_Area.dat** | |
| * | Revided crop distributions to match historical distribution |
| **C2VSimFG_PondedCrop_Area.dat** | |
| * | Modified distribution of rice to be limited to areas in northwest Kern County with |
| **C2VSimFG_NativeVeg_Area.dat** | |
| * | Rebalanced native veg distribution after redistribution of non-ponded crop area to |

## TABLE 2 - Summary of data input for surface water diversion to agriculture by water district applied to C2VSimFG-Kern Historical Simulation

| Water Year | Arvin-Edison WSD | Belridge WSD | Berrenda Mesa WSD | Buena Vista WSD | Cawelo WD | Kern River Canal Co. | Henry Miller WD | Kern Delta WD | Kern-Tulare WD | Lost Hills WD | North Kern WSD | Rosedale Rio Brave WSD | Semi-tropic WSD | Shafter-Wasco ID | So. San Joaquin MUD | Wheeler Ridge - Maricopa WSD | Olcese WD | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| 1986 | 144,722 | 106,293 | 90,909 | 162,444 | 78,084 | 11,017 | 43,242 | 183,471 | 27,131 | 103,268 | 198,865 | 0 | 149,252 | 74,487 | 112,888 | 177,348 | 1,493 | 1,664,914 |
| 1987 | 127,333 | 106,293 | 90,909 | 142,274 | 89,117 | 10,088 | 43,242 | 137,458 | 27,131 | 123,981 | 112,432 | 0 | 172,161 | 53,753 | 76,193 | 161,949 | 1,493 | 1,475,807 |
| 1988 | 114,321 | 106,293 | 90,909 | 141,152 | 77,106 | 2,132 | 43,242 | 135,078 | 27,131 | 111,872 | 81,580 | 0 | 164,192 | 47,071 | 71,243 | 154,030 | 1,417 | 1,368,769 |
| 1989 | 114,591 | 106,293 | 90,909 | 150,341 | 85,190 | 9,389 | 43,242 | 140,360 | 27,131 | 122,044 | 61,797 | 0 | 190,990 | 50,495 | 94,729 | 178,129 | 1,480 | 1,467,110 |
| 1990 | 70,816 | 106,293 | 90,909 | 124,845 | 67,867 | 13,016 | 43,242 | 114,531 | 27,131 | 88,963 | 51,926 | 0 | 49,992 | 34,381 | 73,000 | 170,693 | 1,480 | 1,129,085 |
| 1991 | 40,698 | 106,293 | 90,909 | 100,517 | 50,621 | 9,109 | 43,242 | 117,287 | 27,131 | 9,553 | 28,931 | 0 | 7,926 | 40,595 | 11,683 | 31,030 | 1,480 | 717,005 |
| 1992 | 52,839 | 106,293 | 90,909 | 108,874 | 54,406 | 8,624 | 43,242 | 118,190 | 27,131 | 52,853 | 34,291 | 0 | 94,467 | 45,851 | 65,310 | 96,514 | 1,480 | 1,001,274 |
| 1993 | 137,479 | 93,344 | 85,549 | 151,653 | 75,490 | 9,527 | 43,973 | 174,003 | 26,034 | 77,793 | 181,920 | 5,040 | 226,462 | 72,120 | 108,767 | 137,221 | 1,425 | 1,607,800 |
| 1994 | 171,856 | 110,017 | 93,092 | 125,084 | 62,968 | 12,437 | 53,471 | 132,865 | 28,017 | 87,636 | 117,580 | 2,362 | 110,951 | 47,111 | 83,680 | 151,368 | 1,685 | 1,392,181 |
| 1995 | 134,559 | 110,993 | 78,521 | 189,797 | 73,155 | 2,866 | 29,047 | 159,595 | 27,333 | 85,963 | 174,020 | 5,591 | 235,347 | 62,105 | 108,778 | 153,783 | 1,425 | 1,632,877 |
| 1996 | 166,288 | 112,412 | 115,132 | 184,597 | 90,229 | 8,162 | 39,539 | 179,052 | 28,749 | 145,349 | 202,199 | 5,722 | 313,420 | 72,231 | 128,865 | 189,454 | 1,987 | 1,983,387 |
| 1997 | 185,820 | 143,146 | 97,233 | 197,871 | 88,202 | 8,149 | 50,584 | 179,388 | 29,998 | 122,140 | 191,871 | 4,563 | 313,717 | 67,407 | 124,456 | 188,455 | 1,778 | 1,994,778 |
| 1998 | 120,808 | 79,387 | 85,885 | 152,455 | 69,758 | 2,567 | 30,260 | 124,464 | 24,422 | 80,845 | 153,662 | 4,756 | 240,072 | 53,064 | 89,373 | 148,174 | 849 | 1,460,802 |
| 1999 | 152,909 | 101,786 | 93,199 | 142,271 | 86,667 | 7,905 | 53,858 | 141,626 | 28,093 | 108,563 | 146,395 | 4,679 | 307,686 | 57,625 | 110,686 | 166,018 | 1,248 | 1,711,214 |
| 2000 | 158,008 | 111,057 | 87,200 | 135,689 | 87,894 | 10,902 | 44,302 | 152,338 | 29,948 | 119,828 | 133,872 | 3,920 | 315,833 | 61,358 | 119,597 | 179,278 | 1,382 | 1,752,406 |
| 2001 | 158,432 | 91,642 | 65,734 | 76,718 | 70,873 | 8,577 | 31,379 | 113,044 | 30,109 | 68,302 | 74,725 | 0 | 70,879 | 48,772 | 98,104 | 136,390 | 1,588 | 1,145,268 |
| 2002 | 158,197 | 107,617 | 63,705 | 78,735 | 75,042 | 7,781 | 31,724 | 116,181 | 25,443 | 67,574 | 62,006 | 0 | 165,448 | 55,121 | 103,849 | 133,652 | 1,702 | 1,253,777 |
| 2003 | 139,412 | 103,724 | 64,267 | 96,601 | 75,749 | 7,123 | 33,941 | 161,162 | 24,120 | 62,007 | 106,436 | 1,000 | 265,110 | 55,511 | 106,779 | 120,733 | 2,041 | 1,425,716 |
| 2004 | 155,531 | 118,543 | 68,902 | 86,119 | 78,558 | 8,037 | 39,101 | 138,664 | 25,541 | 67,607 | 99,610 | 1,739 | 174,605 | 58,351 | 106,537 | 138,771 | 1,637 | 1,367,853 |
| 2005 | 136,887 | 105,523 | 69,372 | 125,522 | 78,101 | 4,715 | 39,248 | 169,747 | 21,445 | 60,844 | 207,612 | 2,784 | 294,595 | 58,711 | 109,716 | 127,846 | 1,939 | 1,614,607 |
| 2006 | 140,411 | 115,146 | 84,869 | 149,851 | 96,249 | 3,594 | 46,538 | 172,882 | 22,525 | 73,422 | 199,626 | 0 | 332,115 | 68,468 | 120,106 | 150,416 | 2,048 | 1,778,265 |
| 2007 | 158,526 | 118,036 | 102,971 | 91,196 | 70,811 | 3,650 | 48,482 | 112,341 | 23,348 | 83,116 | 89,195 | 552 | 146,826 | 37,391 | 75,642 | 164,924 | 1,496 | 1,328,502 |
| 2008 | 157,604 | 114,525 | 86,217 | 70,032 | 62,437 | 3,565 | 18,156 | 145,633 | 22,788 | 74,554 | 86,051 | 0 | 29,675 | 47,623 | 87,776 | 168,211 | 1,700 | 1,176,546 |
| 2009 | 145,184 | 113,385 | 86,439 | 73,530 | 67,340 | 3,422 | 12,129 | 126,039 | 21,803 | 83,740 | 84,727 | 0 | 30,808 | 44,265 | 116,967 | 159,502 | 1,781 | 1,171,061 |
| 2010 | 132,462 | 117,589 | 88,556 | 102,109 | 76,351 | 2,930 | 29,694 | 166,787 | 19,272 | 88,191 | 171,744 | 1,543 | 168,870 | 65,238 | 120,394 | 159,162 | 1,756 | 1,512,648 |
| 2011 | 130,306 | 121,808 | 87,344 | 121,329 | 88,617 | 3,535 | 39,642 | 192,069 | 20,213 | 92,149 | 173,305 | 4,466 | 337,724 | 74,413 | 124,678 | 156,216 | 1,530 | 1,769,343 |
| 2012 | 148,146 | 130,559 | 87,953 | 96,407 | 89,745 | 3,302 | 41,553 | 195,763 | 21,682 | 91,720 | 81,584 | 1,329 | 227,901 | 35,369 | 81,602 | 168,753 | 1,783 | 1,505,151 |
| 2013 | 159,887 | 138,131 | 93,311 | 33,558 | 49,978 | 2,913 | 18,533 | 94,682 | 22,252 | 93,322 | 23,343 | 0 | 81,279 | 26,194 | 58,923 | 170,033 | 1,966 | 1,068,305 |
| 2014 | 144,605 | 123,390 | 82,731 | 410 | 41,223 | 1,962 | 2,246 | 70,367 | 14,067 | 82,546 | 11,290 | 0 | 5,748 | 8,303 | 14,249 | 152,372 | 1,238 | 756,746 |
| 2015 | 114,350 | 117,357 | 81,535 | 134 | 38,195 | 2,154 | 0 | 68,228 | 10,274 | 80,631 | 9,901 | 0 | 12,226 | 0 | 3,020 | 145,842 | 1,462 | 685,308 |
| 2016 | 130,405 | 103,032 | 88,053 | 52,717 | 48,753 | 784 | 2,135 | 98,731 | 18,393 | 80,573 | 50,023 | 0 | 112,969 | 29,704 | 62,934 | 162,845 | 1,440 | 1,043,491 |
| 2017 | 146,207 | 115,287 | 92,158 | 203,439 | 73,854 | 2,040 | 39,588 | 162,729 | 21,729 | 88,281 | 108,213 | 17,971 | 359,685 | 59,549 | 115,708 | 176,183 | 1,796 | 1,784,418 |
| 2018 | 143,046 | 112,857 | 91,890 | 78,882 | 54,972 | 1,244 | 3,423 | 125,207 | 22,551 | 87,221 | 121,012 | 4,790 | 154,719 | 47,048 | 98,761 | 167,550 | 1,370 | 1,316,542 |
| 2019 | 141,323 | 112,486 | 92,189 | 155,033 | 71,223 | 1,664 | 10,496 | 132,097 | 22,648 | 86,336 | 129,766 | 12,929 | 300,178 | 63,306 | 102,801 | 164,232 | 1,721 | 1,600,429 |
| 2020 | 135,800 | 102,243 | 90,691 | 43,792 | 44,337 | 654 | 2,712 | 106,406 | 19,543 | 85,788 | 45,689 | 2,541 | 73,613 | 51,269 | 83,676 | 145,373 | 1,774 | 1,035,900 |
| 2021 | 133,553 | 79,606 | 88,546 | 26,999 | 31,995 | 0 | 1,109 | 58,022 | 13,696 | 92,215 | 30,443 | 238 | 13,670 | 14,849 | 32,221 | 145,862 | 318 | 763,342 |
| 2022 | 131,503 | 113,516 | 92,132 | 8,919 | 20,899 | 2,368 | 2,130 | 81,566 | 18,578 | 79,465 | 47,729 | 0 | 4,831 | 22,962 | 44,055 | 95,883 | 11 | 766,547 |
| 2023 | 135,444 | 79,073 | 77,817 | 222,548 | 64,766 | 878 | 44,014 | 163,395 | 18,965 | 79,953 | 289,226 | 11,106 | 301,301 | 124,503 | 102,464 | 106,259 | 753 | 1,822,465 |
| Max | 185,820 | 143,146 | 115,132 | 222,548 | 96,249 | 13,016 | 53,858 | 195,763 | 30,109 | 145,349 | 289,226 | 17,971 | 359,685 | 124,503 | 128,865 | 189,454 | 2,048 | 1,994,778 |
| Average | 136,060 | 109,507 | 86,830 | 110,643 | 68,601 | 5,336 | 31,203 | 135,828 | 23,513 | 86,584 | 109,858 | 2,622 | 172,559 | 50,962 | 88,163 | 150,012 | 1,499 | 1,369,780 |
| Max | 40,698 | 79,073 | 63,705 | 134 | 20,899 | 0 | 0 | 58,022 | 10,274 | 9,553 | 9,901 | 0 | 4,831 | 0 | 3,020 | 31,030 | 11 | 685,308 |

## TABLE 3 - Summary of data input for surface water diversion from Kern River at different diversion and turnouts applied to C2VSimFG-Kern Historical Simulation

| Water Year | Kern River to Beardsley Canal | Kern River to Carrier Canal at Rocky Point | Kern River to Carrier Canal at Calloway Weir | Kern River to CVC at Turnout #4 | Kern River to River Canal | Kern River to Rio Vista at River Walk | Kern River to Rosedale Channel | Kern River to North Lake | Kern River to Pioneer Canal | Kern River to Berrenda Mesa WSD | Kern River to Pioneer Project | Kern River to Kern Water Bank | Kern River to Kern Water Bank Canal | Kern River to 2800 Acre Facility | Kern River to Buena Vista WSD BSA | Kern River to Aqueduct at Intertie | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| 1986 | 291,715 | 199,035 | 238,877 | 181,392 | 0 | 0 | 65,684 | 0 | 63,232 | 0 | 0 | 0 | 0 | 97,866 | 86,736 | 0 | 1,224,537 |
| 1987 | 190,539 | 76,888 | 179,876 | 58,811 | 0 | 0 | 19,893 | 0 | 756 | 0 | 0 | 0 | 0 | 21,592 | 86,736 | 0 | 635,091 |
| 1988 | 111,679 | 25,813 | 163,938 | 21,851 | 0 | 0 | 345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 86,736 | 0 | 410,362 |
| 1989 | 98,796 | 28,696 | 168,926 | 23,291 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 86,736 | 0 | 406,445 |
| 1990 | 77,389 | 5,373 | 128,753 | 6,577 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 86,736 | 0 | 304,828 |
| 1991 | 69,736 | 180,189 | 56,331 | 13,944 | 0 | 0 | 5,869 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 86,736 | 0 | 412,805 |
| 1992 | 71,521 | 194,315 | 690 | 11,008 | 0 | 0 | 3,598 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 86,736 | 0 | 367,868 |
| 1993 | 213,099 | 241,104 | 43,555 | 59,099 | 50,897 | 0 | 54,936 | 0 | 27,803 | 0 | 0 | 0 | 0 | 64,852 | 64,488 | 0 | 819,833 |
| 1994 | 187,380 | 213,631 | 18,103 | 26,829 | 67 | 0 | 0 | 0 | 0 | 9,882 | 0 | 0 | 0 | 28,046 | 38,745 | 0 | 522,683 |
| 1995 | 256,234 | 248,113 | 65,360 | 144,230 | 136,516 | 0 | 91,721 | 0 | 40,366 | 23,822 | 45,284 | 0 | 0 | 60,476 | 103,429 | 11,850 | 1,227,401 |
| 1996 | 315,988 | 255,792 | 105,845 | 108,405 | 119,999 | 0 | 78,824 | 0 | 14,286 | 17,382 | 55,074 | 0 | 0 | 24,037 | 92,768 | 0 | 1,188,400 |
| 1997 | 288,746 | 280,471 | 123,771 | 130,336 | 123,333 | 0 | 62,841 | 0 | 23,271 | 14,977 | 45,600 | 0 | 0 | 27,212 | 134,320 | 52,848 | 1,307,726 |
| 1998 | 312,857 | 244,337 | 143,422 | 131,398 | 23,346 | 0 | 95,706 | 0 | 51,802 | 18,483 | 69,637 | 0 | 0 | 95,160 | 115,019 | 188,048 | 1,489,215 |
| 1999 | 214,847 | 180,856 | 71,974 | 46,274 | 58,082 | 0 | 33,938 | 0 | 839 | 6,915 | 21,343 | 0 | 0 | 17,891 | 77,220 | 0 | 730,179 |
| 2000 | 175,718 | 169,844 | 38,793 | 31,596 | 38,147 | 0 | 20,213 | 0 | 0 | 1,396 | 15,929 | 0 | 0 | 30,660 | 47,882 | 0 | 570,178 |
| 2001 | 130,052 | 188,404 | 23,762 | 14,050 | 4,631 | 0 | 3,177 | 0 | 2,179 | 0 | 0 | 0 | 0 | 0 | 32,686 | 0 | 398,941 |
| 2002 | 91,980 | 203,010 | 4,149 | 23,609 | 7,878 | 0 | 581 | 0 | 199 | 431 | 871 | 0 | 0 | 0 | 29,404 | 0 | 362,112 |
| 2003 | 164,112 | 206,448 | 15,893 | 14,088 | 31,451 | 0 | 12,306 | 0 | 0 | 1,045 | 0 | 0 | 0 | 0 | 38,307 | 0 | 483,650 |
| 2004 | 153,148 | 198,769 | 29,338 | 18,247 | 2,301 | 589 | 1,503 | 165 | 0 | 2,545 | 2,005 | 0 | 0 | 0 | 39,412 | 0 | 448,022 |
| 2005 | 236,776 | 228,885 | 73,215 | 62,146 | 60,019 | 0 | 141,022 | 1,442 | 1,942 | 39,702 | 102,111 | 21,548 | 23,125 | 77,127 | 72,865 | 0 | 1,141,925 |
| 2006 | 257,590 | 247,806 | 53,872 | 122,931 | 33,872 | 3,942 | 87,318 | 1,442 | 9,962 | 24,636 | 116,108 | 25,165 | 34,358 | 42,587 | 97,955 | 0 | 1,159,544 |
| 2007 | 135,525 | 189,169 | 1,049 | 10,483 | 7,752 | 2,746 | 0 | 0 | 0 | 13,099 | 17,809 | 7,507 | 0 | 4,568 | 47,914 | 0 | 437,621 |
| 2008 | 137,813 | 229,304 | 53,824 | 22,700 | 0 | 544 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34,549 | 0 | 478,734 |
| 2009 | 139,246 | 238,103 | 31,342 | 28,635 | 115 | 712 | 109 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18,418 | 0 | 456,680 |
| 2010 | 196,135 | 241,876 | 70,315 | 68,944 | 60,087 | 820 | 10,816 | 776 | 1,775 | 1,165 | 0 | 0 | 0 | 13,748 | 66,441 | 0 | 732,898 |
| 2011 | 298,003 | 266,684 | 75,784 | 160,243 | 90,048 | 1,752 | 101,209 | 787 | 20,479 | 26,223 | 121,857 | 23,951 | 47,187 | 84,876 | 98,416 | 0 | 1,417,499 |
| 2012 | 148,513 | 241,953 | 20,495 | 55,303 | 409 | 1,001 | 10,998 | 0 | 0 | 7,594 | 20,162 | 582 | 0 | 7,871 | 45,173 | 0 | 560,054 |
| 2013 | 45,141 | 153,474 | 706 | 25,758 | 0 | 247 | 0 | 0 | 0 | 3,529 | 0 | 0 | 0 | 155 | 0 | 0 | 229,010 |
| 2014 | 26,041 | 122,044 | 0 | 8,356 | 0 | 283 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 156,724 |
| 2015 | 16,883 | 104,841 | 0 | 0 | 0 | 195 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 121,919 |
| 2016 | 76,773 | 171,255 | 232 | 23,435 | 0 | 1,366 | 0 | 313 | 0 | 455 | 0 | 0 | 0 | 0 | 0 | 0 | 273,829 |
| 2017 | 311,274 | 290,759 | 111,390 | 138,597 | 106,982 | 1,247 | 167,843 | 1,392 | 84,243 | 30,338 | 200,910 | 41,961 | 133,963 | 88,869 | 98,240 | 0 | 1,808,008 |
| 2018 | 128,159 | 219,428 | 81,635 | 48,406 | 7,818 | 998 | 13,905 | 794 | 6,657 | 7,556 | 20,942 | 4,107 | 0 | 34,417 | 0 | 0 | 574,822 |
| 2019 | 221,659 | 248,247 | 120,475 | 99,046 | 65,987 | 905 | 22,942 | 1,871 | 46,472 | 19,100 | 122,757 | 18,251 | 46,124 | 73,268 | 13,948 | 0 | 1,121,052 |
| 2020 | 96,037 | 188,311 | 81,620 | 40,490 | 123 | 905 | 10,000 | 1,160 | 12,948 | 8,590 | 2,134 | 0 | 0 | 23,751 | 0 | 0 | 466,069 |
| 2021 | 29,389 | 133,827 | 0 | 20,910 | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 184,154 |
| 2022 | 30,208 | 151,799 | 2,472 | 27,824 | 0 | 32 | 0 | 35 | 0 | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 212,499 |
| 2023 | 250,229 | 226,044 | 174,907 | 183,535 | 123,114 | 1,800 | 97,161 | 1,647 | 86,147 | 22,321 | 163,577 | 40,299 | 188,021 | 114,446 | 236,128 | 0 | 1,909,376 |
| Max | 315,988 | 290,759 | 238,877 | 183,535 | 136,516 | 3,942 | 167,843 | 1,871 | 86,147 | 39,702 | 200,910 | 41,961 | 188,021 | 114,446 | 236,128 | 188,048 | 1,909,376 |
| Average | 163,077 | 190,392 | 67,755 | 58,231 | 30,341 | 529 | 31,959 | 311 | 13,036 | 7,929 | 30,108 | 4,826 | 12,442 | 27,197 | 59,234 | 6,651 | 704,018 |
| Max | 16,883 | 5,373 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 121,919 |

## TABLE 4 - Summary of data input for surface water diversions for various purposes applied to C2VSimFG-Kern Historical Simulation

| Water Year | Metro Bakersfield Urban Surface Water Supply | Metro Bakersfield Wastewater Land Disposal | Kern Nat'l Wildlife Refuge SWP Supply | Kern Nat'l Wildlife Refuge Surface Water Inflows from Poso Creek | TOTAL |
|---|---|---|---|---|---|
| | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| 1986 | 24,416 | 29,235 | 0 | 1,611 | 30,846 |
| 1987 | 25,298 | 30,832 | 0 | 247 | 31,079 |
| 1988 | 28,563 | 32,304 | 0 | 65 | 32,369 |
| 1989 | 27,818 | 33,785 | 0 | 136 | 33,921 |
| 1990 | 27,426 | 35,756 | 0 | 0 | 35,756 |
| 1991 | 20,959 | 36,837 | 0 | 123 | 36,960 |
| 1992 | 25,867 | 37,801 | 0 | 10 | 37,811 |
| 1993 | 30,261 | 38,774 | 120 | 852 | 39,746 |
| 1994 | 29,111 | 39,684 | 16,861 | 95 | 56,640 |
| 1995 | 27,248 | 40,709 | 12,097 | 896 | 53,702 |
| 1996 | 28,261 | 41,667 | 12,776 | 4,536 | 58,979 |
| 1997 | 19,216 | 40,832 | 7,964 | 13,811 | 62,607 |
| 1998 | 11,036 | 40,355 | 12,268 | 90,926 | 143,549 |
| 1999 | 26,996 | 39,629 | 14,827 | 1,876 | 56,332 |
| 2000 | 30,963 | 41,497 | 7,489 | 58 | 49,044 |
| 2001 | 28,611 | 41,559 | 13,179 | 0 | 54,738 |
| 2002 | 30,185 | 42,043 | 19,299 | 1 | 61,343 |
| 2003 | 32,206 | 42,962 | 20,945 | 22 | 63,929 |
| 2004 | 56,861 | 43,735 | 23,461 | 0 | 67,196 |
| 2005 | 43,727 | 44,021 | 23,310 | 9,025 | 76,356 |
| 2006 | 40,294 | 44,614 | 21,829 | 11,734 | 78,177 |
| 2007 | 55,334 | 44,643 | 21,607 | 2,440 | 68,690 |
| 2008 | 56,335 | 44,936 | 17,728 | 18 | 62,682 |
| 2009 | 58,834 | 45,416 | 19,494 | 9 | 64,919 |
| 2010 | 61,314 | 45,527 | 21,808 | 536 | 67,871 |
| 2011 | 64,388 | 46,429 | 26,599 | 7,691 | 80,719 |
| 2012 | 68,013 | 46,666 | 18,451 | 9 | 65,126 |
| 2013 | 66,998 | 45,513 | 23,701 | 0 | 69,214 |
| 2014 | 55,692 | 44,645 | 13,877 | 0 | 58,522 |
| 2015 | 44,981 | 43,256 | 9,203 | 0 | 52,459 |
| 2016 | 55,334 | 44,643 | 21,607 | 2,440 | 68,690 |
| 2017 | 56,335 | 44,936 | 17,728 | 18 | 62,682 |
| 2018 | 58,834 | 45,416 | 19,494 | 9 | 64,919 |
| 2019 | 61,314 | 45,527 | 21,808 | 536 | 67,871 |
| 2020 | 64,388 | 46,429 | 26,599 | 7,691 | 80,719 |
| 2021 | 68,013 | 46,666 | 18,451 | 9 | 65,126 |
| 2022 | 66,998 | 45,513 | 23,701 | 0 | 69,214 |
| 2023 | 55,692 | 44,645 | 13,877 | 0 | 58,522 |
| Max | 68,013 | 46,666 | 26,599 | 90,926 | 143,549 |
| Average | 43,003 | 41,827 | 14,267 | 4,143 | 60,238 |
| Max | 11,036 | 29,235 | 0 | 0 | 30,846 |

## TABLE 5 - Summary of data input for surface water diversion to groundwater banking and managed aquifer recharge for different facilities applied to C2VSimFG-Kern Historical Simulation

| Water Year | Arvin-Edison WSD | Berrenda Mesa Project | Buena Vista WSD | Cawelo WD | Kern Delta WD | Kern River GSA | North Kern WSD | Rosedale-Rio Bravo WSD | Semi-tropic WSD | West Kern WD | City of Bakers-field | Pioneer Project | Kern Water Bank | Shafter-Wasco ID | Southern San Joaquin MUD | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | | | Acre-ft |
| 1986 | 63,708 | 0 | 28,948 | 0 | 74,308 | 33,628 | 115,498 | 103,384 | 0 | 25,559 | 164,861 | 0 | 0 | 0 | 0 | 609,894 |
| 1987 | 18,800 | 0 | 7,487 | 0 | 49,387 | 12,697 | 47,206 | 47,731 | 0 | 23,249 | 50,585 | 0 | 0 | 0 | 0 | 257,142 |
| 1988 | 1,434 | 0 | 227 | 0 | 38,275 | 11,651 | 11,171 | 19,026 | 0 | 24,594 | 18,294 | 0 | 0 | 0 | 0 | 124,672 |
| 1989 | 3,358 | 0 | 3,532 | 0 | 47,315 | 11,325 | 804 | 27,984 | 0 | 28,604 | 14,148 | 0 | 0 | 0 | 0 | 137,070 |
| 1990 | 4,660 | 0 | 0 | 0 | 32,009 | 3,816 | 0 | 11,530 | 0 | 22,368 | 9,564 | 0 | 0 | 0 | 0 | 83,947 |
| 1991 | 2,404 | 0 | 0 | 0 | 43,724 | 10,853 | 1,224 | 5,931 | 0 | 14,754 | 19,768 | 0 | 0 | 0 | 0 | 98,658 |
| 1992 | 3,886 | 0 | 799 | 0 | 40,038 | 8,459 | 10,236 | 11,880 | 0 | 10,368 | 23,482 | 0 | 0 | 0 | 0 | 109,148 |
| 1993 | 99,714 | 0 | 19,229 | 0 | 55,596 | 27,876 | 25,220 | 88,065 | 0 | 24,420 | 126,544 | 0 | 0 | 0 | 0 | 466,664 |
| 1994 | 28,968 | 0 | 11,485 | 0 | 48,175 | 12,042 | 12,333 | 26,016 | 0 | 29,233 | 67,418 | 0 | 0 | 0 | 0 | 235,670 |
| 1995 | 87,910 | 17,808 | 49,623 | 0 | 62,561 | 35,561 | 149,948 | 119,339 | 0 | 28,201 | 143,019 | 62,274 | 121,465 | 0 | 0 | 877,709 |
| 1996 | 69,472 | 23,398 | 18,253 | 0 | 70,055 | 31,979 | 103,277 | 116,704 | 0 | 37,351 | 75,468 | 51,330 | 232,355 | 0 | 0 | 829,642 |
| 1997 | 58,069 | 9,801 | 38,015 | 7,524 | 75,768 | 27,810 | 102,050 | 108,711 | 0 | 18,555 | 53,470 | 38,169 | 132,457 | 0 | 0 | 670,399 |
| 1998 | 97,098 | 9,493 | 63,868 | 9,136 | 64,206 | 26,027 | 196,469 | 136,250 | 0 | 23,133 | 149,426 | 57,357 | 236,320 | 0 | 0 | 1,068,783 |
| 1999 | 81,398 | 11,489 | 8,904 | 6,110 | 56,201 | 27,657 | 69,080 | 78,941 | 0 | 29,249 | 41,516 | 21,884 | 116,663 | 0 | 0 | 549,092 |
| 2000 | 95,786 | 1,027 | 238 | 3,446 | 61,068 | 13,858 | 163 | 44,501 | 0 | 23,082 | 51,444 | 22,032 | 36,551 | 0 | 0 | 353,196 |
| 2001 | 38,774 | 0 | 99 | 2,683 | 49,509 | 9,902 | 0 | 5,653 | 0 | 8,747 | 22,005 | 1,253 | 10,029 | 0 | 0 | 148,654 |
| 2002 | 4,437 | 0 | 1,065 | 2,596 | 51,729 | 11,698 | 0 | 1,404 | 0 | 19,467 | 11,840 | 0 | 13,439 | 0 | 0 | 117,675 |
| 2003 | 44,030 | 0 | 424 | 3,314 | 69,470 | 8,069 | 367 | 27,154 | 0 | 17,766 | 20,133 | 0 | 5,369 | 0 | 0 | 196,096 |
| 2004 | 7,160 | 3,172 | 0 | 5,172 | 58,314 | 8,401 | 3,039 | 9,626 | 0 | 3,513 | 22,480 | 10,768 | 53,070 | 0 | 0 | 184,715 |
| 2005 | 100,311 | 19,663 | 33,153 | 7,882 | 71,867 | 33,881 | 74,241 | 151,136 | 0 | 29,552 | 164,991 | 93,466 | 308,092 | 0 | 0 | 1,088,235 |
| 2006 | 90,722 | 28,268 | 22,966 | 4,219 | 60,633 | 35,837 | 138,698 | 174,051 | 0 | 14,385 | 113,166 | 64,388 | 308,877 | 0 | 0 | 1,056,210 |
| 2007 | 20,012 | 15,292 | 0 | 5,241 | 44,774 | 7,392 | 80,467 | 20,348 | 0 | 4,209 | 31,534 | 19,386 | 70,553 | 0 | 0 | 319,208 |
| 2008 | 4,409 | 0 | 0 | 5,069 | 46,984 | 6,134 | 0 | 0 | 92 | 0 | 8,787 | 0 | 0 | 0 | 0 | 71,475 |
| 2009 | 34,000 | 0 | 3,000 | 5,239 | 38,150 | 10,067 | 2,596 | 2,354 | 0 | 5,075 | 18,730 | 0 | 0 | 0 | 0 | 119,211 |
| 2010 | 101,606 | 323 | 19,127 | 6,252 | 80,152 | 28,715 | 18,377 | 76,399 | 0 | 10,419 | 40,113 | 0 | 8,272 | 0 | 0 | 389,755 |
| 2011 | 99,559 | 19,373 | 73,880 | 29,630 | 152,586 | 52,798 | 147,576 | 227,775 | 17,276 | 24,880 | 144,869 | 132,320 | 397,029 | 0 | 0 | 1,519,551 |
| 2012 | 27,799 | 20,055 | 0 | 7,162 | 119,694 | 18,339 | 60,613 | 88,019 | 1,865 | 30,166 | 37,046 | 27,293 | 83,991 | 0 | 0 | 522,042 |
| 2013 | 3,947 | 5,750 | 0 | 9,345 | 56,095 | 4,929 | 5,078 | 5,622 | 22 | 2,500 | 11,518 | 0 | 0 | 0 | 0 | 104,806 |
| 2014 | 3,518 | 0 | 0 | 2,102 | 43,253 | 3,401 | 0 | 0 | 0 | 0 | 9,176 | 0 | 0 | 0 | 0 | 61,450 |
| 2015 | 401 | 0 | 0 | 5,893 | 35,241 | 5,127 | 4,768 | 0 | 22 | 0 | 18,840 | 0 | 0 | 0 | 0 | 70,292 |
| 2016 | 5,788 | 0 | 0 | 4,802 | 55,202 | 20,147 | 10,223 | 4,117 | 0 | 0 | 28,649 | 0 | 0 | 4,206 | 0 | 128,928 |
| 2017 | 133,006 | 32,939 | 76,292 | 36,035 | 134,613 | 129,534 | 164,466 | 284,021 | 11,421 | 33,227 | 198,638 | 202,515 | 492,750 | 42,296 | 1,091 | 1,929,457 |
| 2018 | 56,659 | 6,949 | 6,510 | 7,518 | 85,812 | 56,664 | 19,501 | 89,551 | 2,077 | 10,786 | 71,606 | 39,118 | 104,161 | 17,555 | 2,591 | 556,912 |
| 2019 | 85,193 | 18,936 | 22,450 | 39,289 | 112,549 | 89,729 | 139,897 | 167,392 | 6,208 | 15,290 | 142,758 | 122,252 | 302,045 | 35,384 | 2,018 | 1,263,988 |
| 2020 | 6,151 | 9,544 | 974 | 7,126 | 76,180 | 59,436 | 29,316 | 40,211 | 1,642 | 3,023 | 70,678 | 15,767 | 48,767 | 4,574 | 1,203 | 368,814 |
| 2021 | 1,773 | 0 | 974 | 2,770 | 29,991 | 8,771 | 4,875 | 13,081 | 0 | 2,226 | 10,378 | 15,767 | 3,803 | 1,510 | 8 | 94,410 |
| 2022 | 1,056 | 210 | 846 | 5,330 | 42,686 | 11,029 | 15,255 | 0 | 0 | 1,275 | 18,569 | 0 | 0 | 4,772 | 129 | 96,256 |
| 2023 | 138,289 | 27,605 | 221,767 | 26,493 | 128,329 | 31,108 | 163,461 | 261,670 | 3 | 14,108 | 162,971 | 216,990 | 493,722 | 86,366 | 15,986 | 1,886,515 |
| Max | 138,289 | 32,939 | 221,767 | 39,289 | 152,586 | 129,534 | 196,469 | 284,021 | 17,276 | 37,351 | 198,638 | 216,990 | 493,722 | | | 1,929,457 |
| Average | 45,402 | 7,397 | 19,319 | 6,773 | 64,803 | 24,904 | 50,724 | 68,305 | 1,069 | 16,140 | 62,855 | 31,956 | 94,205 | | | 493,851 |
| Max | 401 | 0 | 0 | 0 | 29,991 | 3,401 | 0 | 0 | 0 | 0 | 8,787 | 0 | 0 | | | 61,450 |

## TABLE 6 - Summary of data input for groundwater recovery pumping for local water supply by water district applied to C2VSimFG-Kern Historical Simulation

| Water Year | Arvin-Edison WSD | Berrenda Mesa Project | Buena Vista WSD | City of Bakers-field | Cawelo WD | KCWA ID4 | Kern Delta WD | Kern Water Bank | Lost Hills UD | North Kern WSD | Olcese WD | Pioneer Project | Rosedale Rio Brave WSD | Semi-tropic WSD | West Kern WD | Wheeler Ridge - Maricopa WSD | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| 1986 | 1,955 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 274 | 0 | 101 | 0 | 0 | 0 | 12,073 | 0 | 14,403 |
| 1987 | 21,660 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 278 | 41,963 | 101 | 0 | 0 | 0 | 12,195 | 0 | 76,196 |
| 1988 | 27,486 | 0 | 960 | 0 | 0 | 0 | 0 | 0 | 281 | 67,609 | 138 | 0 | 0 | 0 | 12,316 | 0 | 108,790 |
| 1989 | 38,231 | 0 | 2,507 | 0 | 0 | 0 | 0 | 0 | 285 | 79,674 | 132 | 0 | 0 | 0 | 12,438 | 0 | 133,266 |
| 1990 | 78,769 | 0 | 2,605 | 0 | 957 | 0 | 0 | 0 | 292 | 73,635 | 132 | 0 | 0 | 0 | 12,560 | 0 | 168,949 |
| 1991 | 82,566 | 0 | 2,511 | 0 | 4,666 | 0 | 0 | 0 | 307 | 80,432 | 132 | 0 | 0 | 0 | 12,546 | 0 | 183,160 |
| 1992 | 94,444 | 0 | 4,146 | 0 | 7,124 | 0 | 0 | 0 | 306 | 72,926 | 132 | 0 | 0 | 0 | 12,533 | 5,419 | 197,029 |
| 1993 | 21,035 | 0 | 222 | 0 | 3,469 | 0 | 0 | 0 | 308 | 3,950 | 66 | 0 | 0 | 0 | 12,530 | 150 | 41,730 |
| 1994 | 67,679 | 0 | 1,732 | 0 | 7,805 | 0 | 0 | 0 | 321 | 37,251 | 123 | 0 | 0 | 0 | 12,078 | 2,705 | 129,693 |
| 1995 | 14,191 | 0 | 73 | 0 | 4,628 | 0 | 0 | 0 | 322 | 4,176 | 66 | 0 | 0 | 0 | 11,638 | 0 | 35,094 |
| 1996 | 1,095 | 0 | 175 | 0 | 2,475 | 0 | 0 | 0 | 322 | 4,726 | 143 | 0 | 0 | 2,373 | 13,642 | 0 | 24,950 |
| 1997 | 0 | 0 | 0 | 0 | 2,406 | 0 | 0 | 0 | 322 | 4,261 | 112 | 0 | 0 | 5,824 | 13,962 | 0 | 26,887 |
| 1998 | 245 | 0 | 0 | 0 | 1,008 | 0 | 0 | 0 | 307 | 318 | 232 | 0 | 0 | 1,499 | 13,404 | 76 | 17,089 |
| 1999 | 915 | 0 | 0 | 0 | 2,099 | 0 | 0 | 0 | 333 | 773 | 105 | 0 | 0 | 1,241 | 14,692 | 2,806 | 22,963 |
| 2000 | 2,119 | 0 | 855 | 0 | 6,406 | 0 | 0 | 0 | 336 | 15,864 | 81 | 0 | 0 | 689 | 17,125 | 0 | 43,475 |
| 2001 | 100,492 | 19,482 | 6,115 | 13,950 | 8,533 | 0 | 0 | 86,404 | 350 | 61,988 | 103 | 52,034 | 0 | 0 | 15,714 | 6,507 | 371,673 |
| 2002 | 86,809 | 3,436 | 4,453 | 13,972 | 10,047 | 0 | 0 | 24,664 | 360 | 70,804 | 94 | 9,578 | 0 | 2,082 | 16,247 | 0 | 242,545 |
| 2003 | 30,906 | 0 | 1,619 | 3,211 | 5,484 | 1,892 | 0 | 53,591 | 364 | 21,811 | 56 | 16,181 | 0 | 2,828 | 17,733 | 24 | 155,699 |
| 2004 | 75,399 | 0 | 3,848 | 7,147 | 8,920 | 3,345 | 0 | 27,736 | 393 | 49,888 | 120 | 1,985 | 0 | 2,879 | 20,809 | 41 | 202,510 |
| 2005 | 25,104 | 589 | 430 | 0 | 3,563 | 0 | 0 | 21,553 | 400 | 6,121 | 111 | 12,951 | 0 | 2,145 | 20,843 | 0 | 93,809 |
| 2006 | 174 | 0 | 228 | 0 | 4,202 | 0 | 0 | 0 | 416 | 2,645 | 77 | 0 | 0 | 156 | 22,108 | 0 | 30,007 |
| 2007 | 101,515 | 23,022 | 5,858 | 10,000 | 11,039 | 6,220 | 0 | 167,291 | 419 | 88,841 | 149 | 54,150 | 2,302 | 0 | 23,107 | 0 | 493,914 |
| 2008 | 141,081 | 27,850 | 6,066 | 13,400 | 12,222 | 9,478 | 9,744 | 246,249 | 423 | 100,465 | 115 | 77,533 | 7,470 | 0 | 22,340 | 0 | 674,436 |
| 2009 | 128,043 | 29,745 | 5,315 | 9,086 | 742 | 5,582 | 15,117 | 166,703 | 389 | 111,798 | 144 | 78,033 | 6,001 | 449 | 21,629 | 0 | 578,777 |
| 2010 | 37,081 | 15,117 | 841 | 3,896 | 2,078 | 1,886 | 4,466 | 97,576 | 362 | 20,897 | 112 | 41,021 | 0 | 375 | 21,334 | 0 | 247,041 |
| 2011 | 445 | 0 | 290 | 0 | 146 | 0 | 0 | 0 | 378 | 683 | 115 | 0 | 0 | 500 | 20,801 | 1,037 | 24,395 |
| 2012 | 43,589 | 6,362 | 1,835 | 3,960 | 2,058 | 1,319 | 3,148 | 94,381 | 393 | 103,236 | 107 | 14,257 | 0 | 0 | 21,107 | 14,579 | 310,330 |
| 2013 | 123,971 | 1,379 | 4,261 | 5,571 | 20,994 | 2,252 | 19,809 | 171,627 | 373 | 146,543 | 118 | 41,743 | 14,231 | 0 | 19,494 | 16,518 | 588,883 |
| 2014 | 146,319 | 23,891 | 3,269 | 7,997 | 18,120 | 30,884 | 34,160 | 183,235 | 359 | 133,769 | 472 | 78,603 | 21,604 | 0 | 33,129 | 16,020 | 731,830 |
| 2015 | 123,618 | 26,298 | 1,267 | 3,516 | 24,146 | 38,294 | 32,918 | 154,687 | 358 | 118,342 | 109 | 56,634 | 17,237 | 0 | 20,344 | 13,857 | 631,624 |
| 2016 | 81,182 | 18,461 | 2,609 | 2,259 | 17,334 | 6,069 | 23,429 | 60,440 | 376 | 94,855 | 121 | 35,524 | 9,351 | 4,192 | 24,381 | 12,648 | 393,229 |
| 2017 | 2,492 | 1,629 | 69 | 2,264 | 1,525 | 470 | 402 | 253 | 372 | 13,128 | 61 | 9,025 | 4,631 | 8,302 | 15,198 | 7 | 59,829 |
| 2018 | 17,917 | 8,835 | 945 | 3,053 | 13,261 | 0 | 1,624 | 40,279 | 372 | 62,130 | 108 | 20,537 | 1,378 | 1,086 | 17,343 | 10,218 | 199,086 |
| 2019 | 816 | 786 | 151 | 3,071 | 2,535 | 0 | 0 | 774 | 372 | 15,708 | 112 | 6,446 | 0 | 2,134 | 15,474 | 328 | 48,707 |
| 2020 | 56,992 | 8,679 | 2,830 | 10,397 | 19,382 | 5,900 | 13,629 | 108,653 | 372 | 94,145 | 154 | 55,962 | 15,442 | 0 | 24,503 | 7,041 | 424,082 |
| 2021 | 109,315 | 21,427 | 3,019 | 13,801 | 19,480 | 20,058 | 26,322 | 160,044 | 372 | 124,868 | 198 | 71,207 | 16,302 | 0 | 19,921 | 5,886 | 612,219 |
| 2022 | 70,875 | 26,906 | 436 | 14,887 | 26,591 | 34,866 | 19,495 | 201,954 | 372 | 147,693 | 601 | 68,069 | 20,540 | 0 | 27,859 | 8,388 | 669,533 |
| 2023 | 14,002 | 4,423 | 0 | 3,396 | 2,622 | 8,473 | 2,943 | 50,578 | 372 | 16,849 | 40 | 14,642 | 4,600 | 0 | 12,977 | 0 | 135,917 |
| Max | 146,319 | 29,745 | 6,115 | 14,887 | 26,591 | 38,294 | 34,160 | 246,249 | 423 | 147,693 | 601 | 78,603 | 21,604 | 8,302 | 33,129 | 16,518 | 731,830 |
| Average | 51,856 | 7,061 | 1,883 | 3,917 | 7,318 | 4,658 | 5,453 | 55,755 | 350 | 55,125 | 137 | 21,477 | 3,713 | 1,020 | 17,635 | 3,270 | 240,625 |
| Max | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 274 | 0 | 40 | 0 | 0 | 0 | 11,638 | 0 | 14,403 |

## TABLE 7 - Summary of data input for groundwater pumping for basin export by water district applied to C2VSimFG-Kern Historical Simulation

| Water Year | Arvin-Edison WSD to Aqueduct | DWR to Aqueduct | North Kern WSD to Friant-Kern Canal | Rosedale Rio Brave WSD to CVC | Semi-tropic WSD to Aqueduct | Wheeler Ridge - Maricopa WSD to Aqueduct | County of Kern to BVARA | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| 1986 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1987 | 0 | 0 | 0 | 0 | 0 | 0 | 673 | 673 |
| 1988 | 0 | 0 | 0 | 0 | 0 | 0 | 6,301 | 6,301 |
| 1989 | 0 | 0 | 0 | 0 | 0 | 0 | 5,879 | 5,879 |
| 1990 | 0 | 0 | 0 | 0 | 0 | 0 | 8,836 | 8,836 |
| 1991 | 0 | 0 | 0 | 0 | 0 | 0 | 22,114 | 22,114 |
| 1992 | 0 | 0 | 0 | 0 | 0 | 0 | 25,025 | 25,025 |
| 1993 | 0 | 0 | 0 | 0 | 0 | 0 | 7,521 | 7,521 |
| 1994 | 0 | 0 | 0 | 0 | 0 | 0 | 3,261 | 3,261 |
| 1995 | 0 | 2,319 | 0 | 0 | 0 | 0 | 4,748 | 7,067 |
| 1996 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1997 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1998 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1999 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2000 | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 56 |
| 2001 | 0 | 0 | 0 | 0 | 1,457 | 638 | 10,024 | 12,119 |
| 2002 | 0 | 0 | 0 | 0 | 21,819 | 0 | 22,402 | 44,221 |
| 2003 | 12,380 | 0 | 0 | 0 | 0 | 0 | 9,886 | 22,266 |
| 2004 | 11,573 | 0 | 0 | 0 | 8,965 | 0 | 13,643 | 34,181 |
| 2005 | 13,939 | 0 | 0 | 0 | 19,103 | 0 | 6,071 | 39,113 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2007 | 7,609 | 0 | 7,276 | 0 | 6,282 | 0 | 10,437 | 31,604 |
| 2008 | 42,615 | 0 | 4,612 | 0 | 92,169 | 0 | 17,351 | 156,747 |
| 2009 | 43,080 | 0 | 5,880 | 0 | 86,194 | 7,243 | 7,786 | 150,183 |
| 2010 | 56,229 | 0 | 73 | 0 | 37,995 | 12,404 | 7,019 | 113,720 |
| 2011 | 16,065 | 0 | 0 | 0 | 0 | 0 | 369 | 16,434 |
| 2012 | 10,010 | 0 | 6,803 | 0 | 0 | 1,340 | 1,889 | 20,042 |
| 2013 | 15,111 | 0 | 7,471 | 12,116 | 5,610 | 3,815 | 9,786 | 53,909 |
| 2014 | 45,195 | 0 | 12,071 | 28,818 | 95,611 | 18,236 | 21,567 | 221,498 |
| 2015 | 67,142 | 0 | 9,752 | 26,314 | 89,453 | 26,943 | 23,330 | 242,934 |
| 2016 | 53,134 | 0 | 2,993 | 10,822 | 89,371 | 20,333 | 10,809 | 187,462 |
| 2017 | 5,963 | 0 | 17,888 | 1,933 | 0 | 9,616 | 4,037 | 39,437 |
| 2018 | 13,893 | 0 | 3,823 | 8,045 | 0 | 12,910 | 8,844 | 47,515 |
| 2019 | 6,393 | 0 | 10,136 | 0 | 0 | 44 | 7,020 | 23,593 |
| 2020 | 0 | 0 | 14,172 | 37,509 | 0 | 17,096 | 8,079 | 76,856 |
| 2021 | 0 | 0 | 10,785 | 65,041 | 43,955 | 23,337 | 10,853 | 153,971 |
| 2022 | 3,574 | 0 | 7,034 | 51,684 | 130,892 | 25,367 | 9,847 | 228,398 |
| 2023 | 0 | 0 | 0 | 5,365 | 73,252 | 1,270 | 3,771 | 83,658 |
| Max | 67,142 | 2,319 | 17,888 | 65,041 | 130,892 | 26,943 | 25,025 | 242,934 |
| Average | 11,155 | 61 | 3,178 | 6,517 | 21,109 | 4,752 | 8,138 | 54,910 |
| Max | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## TABLE 8 - Summary of population data input by urban zone applied to C2VSimFG-Kern Historical Simulation

| Water Year | Urban Zone 97 | Urban Zone 98 | Urban Zone 99 | Urban Zone 100 | Urban Zone 102 | Urban Zone 103 | Urban Zone 104 | Urban Zone 105 | Urban Zone 106 | Total | Annual Growth Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Population | Population | Population | Population | Population | Population | Population | Population | Population | Population | percent |
| 1985 | 18,266 | 4,545 | 54,766 | 199 | 11,589 | 1,845 | 15,756 | 443 | 229,085 | 336,493 | |
| 1986 | 18,506 | 4,565 | 56,021 | 184 | 11,631 | 1,868 | 16,127 | 443 | 245,095 | 354,441 | 5.3% |
| 1987 | 18,747 | 4,586 | 57,277 | 170 | 11,673 | 1,892 | 16,498 | 443 | 261,105 | 372,389 | 5.1% |
| 1988 | 18,987 | 4,607 | 58,532 | 155 | 11,715 | 1,915 | 16,869 | 442 | 277,114 | 390,337 | 4.8% |
| 1989 | 19,227 | 4,627 | 59,788 | 141 | 11,758 | 1,939 | 17,240 | 442 | 293,124 | 408,285 | 4.6% |
| 1990 | 19,467 | 4,648 | 61,043 | 126 | 11,800 | 1,962 | 17,611 | 442 | 309,134 | 426,233 | 4.4% |
| 1991 | 19,808 | 4,662 | 64,110 | 132 | 12,190 | 2,023 | 17,570 | 475 | 316,532 | 437,502 | 2.6% |
| 1992 | 20,150 | 4,676 | 67,178 | 138 | 12,581 | 2,084 | 17,528 | 507 | 323,930 | 448,771 | 2.6% |
| 1993 | 20,491 | 4,690 | 70,245 | 144 | 12,971 | 2,145 | 17,487 | 540 | 331,328 | 460,041 | 2.5% |
| 1994 | 20,832 | 4,704 | 73,313 | 150 | 13,362 | 2,206 | 17,445 | 572 | 338,726 | 471,310 | 2.4% |
| 1995 | 21,174 | 4,718 | 76,380 | 156 | 13,752 | 2,268 | 17,404 | 605 | 346,124 | 482,579 | 2.4% |
| 1996 | 21,515 | 4,732 | 79,447 | 161 | 14,142 | 2,329 | 17,363 | 637 | 353,522 | 493,848 | 2.3% |
| 1997 | 21,856 | 4,746 | 82,515 | 167 | 14,533 | 2,390 | 17,321 | 670 | 360,920 | 505,117 | 2.3% |
| 1998 | 22,197 | 4,760 | 85,582 | 173 | 14,923 | 2,451 | 17,280 | 702 | 368,318 | 516,387 | 2.2% |
| 1999 | 22,539 | 4,774 | 88,650 | 179 | 15,314 | 2,512 | 17,238 | 735 | 375,716 | 527,656 | 2.2% |
| 2000 | 22,880 | 4,788 | 91,717 | 185 | 15,704 | 2,573 | 17,197 | 767 | 383,114 | 538,925 | 2.1% |
| 2001 | 23,154 | 4,887 | 94,141 | 193 | 16,313 | 2,601 | 17,609 | 742 | 395,409 | 555,047 | 3.0% |
| 2002 | 23,429 | 4,985 | 96,564 | 200 | 16,922 | 2,628 | 18,020 | 717 | 407,703 | 571,169 | 2.9% |
| 2003 | 23,703 | 5,084 | 98,988 | 208 | 17,532 | 2,656 | 18,432 | 692 | 419,998 | 587,291 | 2.8% |
| 2004 | 23,977 | 5,182 | 101,412 | 215 | 18,141 | 2,683 | 18,844 | 667 | 432,292 | 603,413 | 2.7% |
| 2005 | 24,252 | 5,281 | 103,836 | 223 | 18,750 | 2,711 | 19,256 | 643 | 444,587 | 619,536 | 2.7% |
| 2006 | 24,526 | 5,379 | 106,259 | 230 | 19,359 | 2,738 | 19,667 | 618 | 456,882 | 635,658 | 2.6% |
| 2007 | 24,800 | 5,478 | 108,683 | 238 | 19,968 | 2,766 | 20,079 | 593 | 469,176 | 651,780 | 2.5% |
| 2008 | 25,074 | 5,576 | 111,107 | 245 | 20,578 | 2,793 | 20,491 | 568 | 481,471 | 667,902 | 2.5% |
| 2009 | 25,349 | 5,675 | 113,530 | 253 | 21,187 | 2,821 | 20,902 | 543 | 493,765 | 684,024 | 2.4% |
| 2010 | 25,623 | 5,773 | 115,954 | 260 | 21,796 | 2,848 | 21,314 | 518 | 506,060 | 700,146 | 2.4% |
| 2011 | 25,815 | 5,802 | 117,403 | 261 | 21,959 | 2,862 | 21,474 | 519 | 512,386 | 708,482 | 1.2% |
| 2012 | 26,009 | 5,831 | 118,871 | 261 | 22,124 | 2,877 | 21,635 | 521 | 518,791 | 716,919 | 1.2% |
| 2013 | 26,204 | 5,860 | 120,357 | 262 | 22,290 | 2,891 | 21,797 | 522 | 525,275 | 725,458 | 1.2% |
| 2014 | 26,400 | 5,889 | 121,861 | 263 | 22,457 | 2,905 | 21,961 | 523 | 531,841 | 734,102 | 1.2% |
| 2015 | 26,598 | 5,919 | 123,385 | 263 | 22,626 | 2,920 | 22,125 | 525 | 538,489 | 742,850 | 1.2% |
| 2016 | 27,224 | 5,966 | 127,867 | 264 | 23,159 | 2,932 | 22,302 | 527 | 551,163 | 761,404 | 2.5% |
| 2017 | 27,543 | 5,990 | 130,168 | 265 | 23,430 | 2,938 | 22,392 | 528 | 557,612 | 770,866 | 1.2% |
| 2018 | 27,865 | 6,014 | 132,511 | 265 | 23,704 | 2,943 | 22,481 | 529 | 564,136 | 780,448 | 1.2% |
| 2019 | 28,191 | 6,038 | 134,897 | 266 | 23,981 | 2,949 | 22,571 | 530 | 570,736 | 790,159 | 1.2% |
| 2020 | 28,521 | 6,062 | 137,325 | 266 | 24,262 | 2,955 | 22,661 | 531 | 577,414 | 799,997 | 1.2% |
| 2021 | 28,854 | 6,087 | 139,797 | 267 | 24,545 | 2,961 | 22,752 | 532 | 584,170 | 809,965 | 1.2% |
| 2022 | 29,192 | 6,111 | 142,313 | 267 | 24,833 | 2,967 | 22,843 | 533 | 591,005 | 820,064 | 1.2% |
| 2023 | 29,533 | 6,136 | 144,875 | 268 | 25,123 | 2,973 | 22,934 | 535 | 597,919 | 830,296 | 1.2% |
| Max | 29,533 | 6,136 | 144,875 | 268 | 25,123 | 2,973 | 22,934 | 767 | 597,919 | 830,296 | 5.3% |
| Average | 23,953 | 5,297 | 100,366 | 212 | 18,239 | 2,576 | 19,545 | 568 | 437,160 | 607,916 | 2.4% |
| Max | 18,506 | 4,565 | 56,021 | 126 | 11,631 | 1,868 | 16,127 | 442 | 245,095 | 354,441 | 1.2% |

## TABLE 9 - Summary of data input of per-capita water use by urban zone applied to C2VSimFG-Kern Historical simulation

| Water Year | Urban Zone 97 | Urban Zone 98 | Urban Zone 99 | Urban Zone 100 | Urban Zone 102 | Urban Zone 103 | Urban Zone 104 | Urban Zone 105 | Urban Zone 106 |
|---|---|---|---|---|---|---|---|---|---|
| | gdpc | gdpc | gdpc | gdpc | gdpc | gdpc | gdpc | gdpc | gdpc |
| 1985 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 508 |
| 1986 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 478 |
| 1987 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 453 |
| 1988 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 440 |
| 1989 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 412 |
| 1990 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 421 |
| 1991 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 408 |
| 1992 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 413 |
| 1993 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 423 |
| 1994 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 413 |
| 1995 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 375 |
| 1996 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 405 |
| 1997 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 363 |
| 1998 | 228 | 196 | 245 | 159 | 180 | 159 | 293 | 159 | 287 |
| 1999 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 378 |
| 2000 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 382 |
| 2001 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 374 |
| 2002 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 374 |
| 2003 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 355 |
| 2004 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 400 |
| 2005 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 334 |
| 2006 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 330 |
| 2007 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 377 |
| 2008 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 378 |
| 2009 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 343 |
| 2010 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 330 |
| 2011 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 343 |
| 2012 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 379 |
| 2013 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 333 |
| 2014 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 329 |
| 2015 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 269 |
| 2016 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 263 |
| 2017 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 274 |
| 2018 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 261 |
| 2019 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 232 |
| 2020 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 231 |
| 2021 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 232 |
| 2022 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 226 |
| 2023 | 228 | 196 | 248 | 159 | 159 | 159 | 237 | 159 | 218 |
| Max | 228 | 196 | 248 | 159 | 180 | 159 | 293 | 159 | 478 |
| Average | 228 | 196 | 247 | 159 | 166 | 159 | 256 | 159 | 348 |
| Max | 228 | 196 | 245 | 159 | 159 | 159 | 237 | 159 | 218 |

## TABLE 10 - Summary of data input for crop evapotranspiration (ET) by crop type based on METRIC satellite data applied to C2VSimFG-Kern Historical Simulation

| Water Year | Grain | Cotton | Sugar Beets | Cotton | Dry Beans | Saf-flower | Other Field Crops | Alfalfa | Pasture | Tomoto-Processed | Tomato-Fresh | Curcubits | Onions & Garlic | Potatoes | Other Truck | Almonds & Pistachios | Orchards | Citrus | Vineyards | Idle | Rice | Refuge | Urban | Native |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Units | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr | in/yr |
| 1985 | 30.0 | 31.6 | 34.6 | 35.4 | 30.8 | 28.0 | 27.9 | 38.9 | 35.8 | 28.8 | 27.3 | 24.9 | 28.7 | 27.6 | 29.3 | 31.6 | 29.7 | 36.5 | 25.0 | 27.4 | 35.8 | 31.6 | 28.1 | 27.5 |
| 1986 | 28.2 | 28.9 | 36.4 | 32.8 | 28.0 | 26.2 | 29.2 | 39.3 | 35.5 | 29.8 | 28.8 | 27.7 | 26.5 | 26.2 | 27.9 | 35.1 | 33.6 | 36.8 | 26.9 | 27.1 | 39.3 | 36.2 | 27.8 | 26.8 |
| 1987 | 33.8 | 35.2 | 39.5 | 33.3 | 31.0 | 26.3 | 31.4 | 44.5 | 33.2 | 34.2 | 28.3 | 27.2 | 31.3 | 30.9 | 31.2 | 41.4 | 37.1 | 43.4 | 32.1 | 30.6 | 40.7 | 32.2 | 32.3 | 33.0 |
| 1988 | 33.8 | 35.2 | 39.5 | 33.3 | 31.0 | 26.3 | 31.4 | 44.5 | 33.2 | 34.2 | 28.3 | 27.2 | 31.3 | 30.9 | 31.2 | 41.4 | 37.1 | 43.4 | 32.1 | 30.6 | 40.7 | 32.2 | 32.3 | 33.0 |
| 1989 | 33.8 | 35.2 | 39.5 | 33.3 | 31.0 | 26.3 | 31.4 | 44.5 | 33.2 | 34.2 | 28.3 | 27.2 | 31.3 | 30.9 | 31.2 | 41.4 | 37.1 | 43.4 | 32.1 | 30.6 | 40.7 | 32.2 | 32.3 | 33.0 |
| 1990 | 33.8 | 35.2 | 39.5 | 33.3 | 31.0 | 26.3 | 31.4 | 44.5 | 33.2 | 34.2 | 28.3 | 27.2 | 31.3 | 30.9 | 31.2 | 41.4 | 37.1 | 43.4 | 32.1 | 30.6 | 40.7 | 32.2 | 32.3 | 33.0 |
| 1991 | 30.0 | 31.6 | 34.6 | 35.4 | 30.8 | 28.0 | 27.9 | 38.9 | 35.8 | 28.8 | 27.3 | 24.9 | 28.7 | 27.6 | 29.3 | 31.6 | 29.7 | 36.5 | 25.0 | 27.4 | 35.8 | 31.6 | 28.1 | 27.5 |
| 1992 | 33.8 | 35.2 | 39.5 | 33.3 | 31.0 | 26.3 | 31.4 | 44.5 | 33.2 | 34.2 | 28.3 | 27.2 | 31.3 | 30.9 | 31.2 | 41.4 | 37.1 | 43.4 | 32.1 | 30.6 | 40.7 | 32.2 | 32.3 | 33.0 |
| 1993 | 28.2 | 28.9 | 36.4 | 32.8 | 28.0 | 26.2 | 29.2 | 39.3 | 35.5 | 29.8 | 28.8 | 27.7 | 26.5 | 26.2 | 27.9 | 35.1 | 33.6 | 36.8 | 26.9 | 27.1 | 39.3 | 36.2 | 27.8 | 26.8 |
| 1994 | 29.5 | 34.0 | 36.9 | 37.0 | 31.9 | 24.0 | 36.5 | 37.6 | 31.4 | 32.4 | 27.3 | 27.4 | 34.1 | 28.7 | 31.6 | 37.2 | 37.5 | 38.7 | 29.1 | 33.3 | 26.6 | 23.9 | 27.0 | 27.3 |
| 1995 | 30.1 | 32.4 | 35.8 | 34.4 | 30.7 | 26.6 | 30.7 | 36.6 | 32.6 | 29.4 | 29.0 | 28.1 | 33.1 | 27.4 | 30.2 | 35.8 | 35.5 | 35.8 | 28.7 | 32.2 | 31.6 | 36.3 | 27.5 | 29.6 |
| 1996 | 35.0 | 37.1 | 39.7 | 39.2 | 38.2 | 32.6 | 35.8 | 42.3 | 38.7 | 36.1 | 32.7 | 28.7 | 35.3 | 30.4 | 33.0 | 39.3 | 40.1 | 39.4 | 32.1 | 32.8 | 34.1 | 36.4 | 30.2 | 31.0 |
| 1997 | 31.3 | 35.5 | 39.1 | 37.7 | 33.9 | 29.3 | 37.2 | 43.5 | 36.0 | 33.2 | 28.1 | 28.8 | 29.7 | 28.8 | 30.1 | 33.7 | 34.0 | 38.1 | 26.1 | 30.6 | 34.1 | 34.0 | 28.1 | 31.1 |
| 1998 | 28.2 | 28.9 | 36.4 | 32.8 | 28.0 | 26.2 | 29.2 | 39.3 | 35.5 | 29.8 | 28.8 | 27.7 | 26.5 | 26.2 | 27.9 | 35.1 | 33.6 | 36.8 | 26.9 | 27.1 | 39.3 | 36.2 | 27.8 | 26.8 |
| 1999 | 30.0 | 31.6 | 34.6 | 35.4 | 30.8 | 28.0 | 27.9 | 38.9 | 35.8 | 28.8 | 27.3 | 24.9 | 28.7 | 27.6 | 29.3 | 31.6 | 29.7 | 36.5 | 25.0 | 27.4 | 35.8 | 31.6 | 28.1 | 27.5 |
| 2000 | 31.1 | 34.6 | 36.0 | 33.2 | 29.4 | 28.7 | 33.8 | 44.0 | 38.6 | 32.2 | 32.3 | 27.3 | 30.5 | 29.4 | 29.5 | 37.0 | 34.6 | 41.0 | 28.9 | 27.6 | 41.2 | 31.4 | 32.3 | 33.0 |
| 2001 | 31.9 | 33.4 | 36.3 | 32.0 | 29.3 | 27.2 | 32.1 | 44.5 | 33.8 | 30.2 | 29.9 | 26.5 | 28.8 | 28.1 | 28.8 | 39.9 | 36.0 | 40.7 | 29.7 | 28.0 | 41.7 | 30.8 | 30.5 | 31.6 |
| 2002 | 33.8 | 35.2 | 39.5 | 33.3 | 31.0 | 26.3 | 31.4 | 44.5 | 33.2 | 34.2 | 28.3 | 27.2 | 31.3 | 30.9 | 31.2 | 41.4 | 37.1 | 43.4 | 32.1 | 30.6 | 40.7 | 32.2 | 32.3 | 33.0 |
| 2003 | 33.0 | 35.5 | 35.6 | 33.2 | 33.5 | 28.0 | 31.7 | 42.9 | 30.6 | 31.0 | 26.2 | 27.8 | 29.7 | 27.2 | 28.4 | 39.6 | 32.8 | 38.8 | 30.4 | 29.7 | 37.0 | 32.1 | 28.5 | 30.4 |
| 2004 | 34.5 | 36.6 | 37.3 | 33.5 | 33.3 | 32.8 | 35.6 | 46.4 | 36.1 | 33.1 | 26.4 | 26.1 | 32.4 | 30.3 | 33.1 | 44.2 | 36.7 | 40.0 | 33.1 | 35.5 | 39.0 | 31.5 | 30.1 | 32.4 |
| 2005 | 31.8 | 35.4 | 40.6 | 30.5 | 31.8 | 27.8 | 33.0 | 40.7 | 32.3 | 28.4 | 23.7 | 26.8 | 29.6 | 28.4 | 28.0 | 35.1 | 30.2 | 34.8 | 28.0 | 29.6 | 37.3 | 34.1 | 28.2 | 30.0 |
| 2006 | 30.9 | 33.7 | 33.7 | 31.4 | 31.3 | 24.9 | 31.1 | 41.4 | 33.2 | 25.4 | 26.9 | 29.5 | 26.9 | 31.9 | 28.2 | 33.9 | 28.6 | 35.0 | 27.6 | 27.3 | 39.6 | 39.3 | 27.9 | 29.0 |
| 2007 | 34.3 | 36.5 | 33.9 | 36.1 | 31.6 | 28.9 | 35.3 | 44.1 | 35.3 | 29.4 | 24.4 | 26.7 | 29.1 | 27.8 | 32.5 | 34.5 | 29.6 | 37.6 | 29.6 | 29.7 | 38.0 | 34.0 | 27.7 | 31.5 |
| 2008 | 35.2 | 34.1 | 30.6 | 35.3 | 29.7 | 25.1 | 36.0 | 43.8 | 37.2 | 28.0 | 25.1 | 25.7 | 29.7 | 29.1 | 31.3 | 33.2 | 31.5 | 37.9 | 29.6 | 26.9 | 34.2 | 29.9 | 28.3 | 31.4 |
| 2009 | 35.3 | 34.1 | 25.1 | 34.2 | 32.4 | 32.6 | 33.9 | 42.2 | 30.9 | 26.5 | 24.4 | 24.9 | 27.1 | 29.3 | 29.6 | 34.5 | 31.9 | 37.8 | 30.4 | 28.9 | 35.8 | 30.5 | 27.9 | 32.0 |
| 2010 | 31.6 | 28.9 | 25.8 | 30.2 | 28.5 | 23.7 | 29.8 | 38.7 | 26.8 | 23.2 | 23.4 | 26.2 | 25.4 | 26.5 | 27.0 | 37.3 | 31.0 | 35.5 | 32.3 | 28.3 | 33.7 | 30.8 | 27.1 | 30.2 |
| 2011 | 30.1 | 28.2 | 23.9 | 28.3 | 27.0 | 21.8 | 29.6 | 36.0 | 25.1 | 22.6 | 27.0 | 24.4 | 25.5 | 25.8 | 25.2 | 36.2 | 32.0 | 33.6 | 30.9 | 26.6 | 38.1 | 33.6 | 26.9 | 32.7 |
| 2012 | 30.2 | 27.3 | 22.5 | 28.7 | 26.3 | 23.0 | 31.0 | 35.8 | 26.1 | 22.6 | 28.1 | 24.3 | 25.8 | 26.1 | 26.1 | 36.6 | 31.7 | 33.9 | 31.2 | 26.0 | 38.4 | 33.8 | 27.5 | 33.0 |
| 2013 | 35.7 | 35.5 | 28.0 | 34.7 | 32.7 | 33.2 | 36.4 | 44.0 | 33.1 | 27.2 | 30.7 | 29.1 | 32.4 | 30.1 | 30.1 | 43.6 | 35.5 | 39.9 | 38.6 | 29.5 | 36.3 | 36.8 | 29.1 | 35.2 |
| 2014 | 33.9 | 33.6 | 25.2 | 32.9 | 28.4 | 28.8 | 36.0 | 40.4 | 28.8 | 25.2 | 28.2 | 28.3 | 28.6 | 28.7 | 29.8 | 42.5 | 33.0 | 37.8 | 34.1 | 28.5 | 36.0 | 35.8 | 29.2 | 34.2 |
| 2015 | 33.4 | 34.2 | 28.3 | 36.3 | 31.9 | 33.9 | 37.0 | 43.2 | 29.0 | 24.0 | 26.4 | 27.1 | 34.8 | 27.5 | 30.7 | 38.8 | 31.8 | 38.3 | 31.0 | 28.1 | 29.6 | 32.2 | 27.9 | 32.4 |
| 2016 | 32.5 | 30.3 | 25.9 | 33.0 | 27.8 | 25.6 | 36.2 | 36.9 | 32.7 | 27.1 | 24.9 | 26.0 | 23.5 | 24.6 | 27.6 | 41.8 | 31.9 | 35.5 | 33.8 | 28.9 | 30.5 | 34.4 | 27.9 | 34.1 |
| 2017 | 35.6 | 32.4 | 27.2 | 35.1 | 33.4 | 27.1 | 37.6 | 36.6 | 36.7 | 32.5 | 24.5 | 29.8 | 27.2 | 31.8 | 31.7 | 48.5 | 35.9 | 39.3 | 39.2 | 34.5 | 41.2 | 41.8 | 29.7 | 35.0 |
| 2018 | 36.1 | 32.6 | 37.2 | 36.0 | 34.6 | 34.3 | 37.5 | 36.3 | 36.3 | 35.2 | 32.7 | 33.1 | 26.4 | 29.8 | 31.1 | 46.6 | 35.3 | 38.6 | 38.5 | 35.5 | 32.1 | 34.9 | 29.9 | 34.1 |
| 2019 | 37.2 | 33.4 | 43.2 | 37.2 | 35.0 | 33.2 | 36.5 | 37.0 | 36.7 | 37.0 | 28.0 | 31.6 | 29.0 | 30.9 | 31.4 | 46.5 | 34.8 | 38.1 | 37.3 | 37.1 | 37.0 | 38.1 | 29.3 | 34.1 |
| 2020 | 27.8 | 25.1 | 36.9 | 27.6 | 28.0 | 33.2 | 24.3 | 28.2 | 27.6 | 28.4 | 19.6 | 23.3 | 24.1 | 23.6 | 25.2 | 34.5 | 26.0 | 27.7 | 26.8 | 26.9 | 24.0 | 33.5 | 31.7 | 26.3 |
| 2021 | 34.5 | 31.7 | 43.4 | 33.9 | 35.6 | 41.0 | 30.1 | 35.6 | 36.0 | 36.2 | 14.6 | 28.5 | 29.3 | 27.6 | 30.4 | 40.9 | 33.3 | 33.2 | 31.8 | 30.2 | 28.6 | 38.7 | 32.3 | 22.9 |
| 2022 | 30.2 | 28.0 | 49.5 | 32.0 | 39.0 | 34.6 | 33.2 | 31.1 | 35.7 | 34.8 | 24.9 | 27.0 | 33.4 | 26.9 | 29.9 | 35.1 | 28.9 | 29.5 | 30.0 | 29.5 | 24.5 | 35.8 | 33.9 | 25.6 |
| 2023 | 29.9 | 33.0 | 20.5 | 31.8 | 20.5 | 20.5 | 26.1 | 35.5 | 27.6 | 29.3 | 29.3 | 25.3 | 22.7 | 21.5 | 23.9 | 36.6 | 25.6 | 34.3 | 30.0 | 29.5 | 24.5 | 35.8 | 33.9 | 25.7 |
| **Average** | **32.4** | **33.4** | **33.0** | **33.4** | **30.9** | **27.8** | **32.9** | **41.5** | **33.0** | **28.8** | **27.5** | **26.9** | **29.3** | **28.5** | **29.5** | **37.3** | **33.3** | **37.7** | **30.3** | **29.1** | **37.1** | **33.6** | **28.8** | **31.3** |

## Table 11 - Historical and Current Groundwater Budget for the Kern County Subbasin for Water Years 1995 to 2023 based on the C2VSimFG-Kern Simulation

| Water Year | Deep Percolation | Managed Recharge and Canal Seepage | Net GW/SW Interactions | GW Pumping | Small Watershed Inflow | Subsurface Flow with Adjacent GW Basins | Change in Groundwater Storage |
|---|---|---|---|---|---|---|---|
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| **SUMMARY: WY1995 to WY2023 Simulatation Period** | | | | | | | |
| **Total** | 19,241,188 | 18,254,872 | 2,830,842 | -48,089,274 | 1,533,153 | -2,350,917 | **-8,580,169** |
| **Average** | 663,489 | 629,478 | 97,615 | -1,658,251 | 52,867 | -81,066 | **-295,868** |
| **SUMMARY: WY1995 to WY2014 Historical Period** | | | | | | | |
| **Total** | 13,366,806 | 11,671,966 | 1,972,014 | -31,728,347 | 975,198 | -1,741,603 | **-5,483,995** |
| **Average** | 668,340 | 583,598 | 98,601 | -1,586,417 | 48,760 | -87,080 | **-274,200** |
| **SUMMARY: WY2015 to WY2023 Current Period** | | | | | | | |
| **Total** | 5,874,382 | 6,582,905 | 858,828 | -16,360,927 | 557,955 | -609,314 | **-3,096,173** |
| **Average** | 652,709 | 731,434 | 95,425 | -1,817,881 | 61,995 | -67,702 | **-344,019** |
| **Annual Simulation Results for WY1995 to WY2023 Simulation Period** | | | | | | | |
| 1995 | 880,433 | 944,800 | 185,777 | -945,538 | 122,287 | -75,303 | 1,112,457 |
| 1996 | 801,525 | 926,537 | 106,693 | -1,245,932 | 41,190 | -84,688 | 545,324 |
| 1997 | 766,620 | 771,510 | 126,405 | -1,066,862 | 50,548 | -87,402 | 560,817 |
| 1998 | 1,034,825 | 1,097,180 | 121,413 | -882,967 | 155,312 | -87,561 | 1,438,202 |
| 1999 | 755,543 | 633,676 | 39,705 | -1,107,275 | 32,155 | -85,273 | 268,526 |
| 2000 | 616,913 | 462,522 | 91,455 | -1,373,755 | 25,956 | -83,813 | -260,723 |
| 2001 | 551,581 | 222,131 | 66,647 | -1,834,735 | 24,633 | -81,958 | -1,051,701 |
| 2002 | 466,234 | 202,687 | 76,147 | -1,757,505 | 18,882 | -83,943 | -1,077,499 |
| 2003 | 502,293 | 297,019 | 118,149 | -1,491,321 | 34,003 | -85,633 | -625,490 |
| 2004 | 487,803 | 284,862 | 83,292 | -1,857,078 | 27,959 | -89,263 | -1,062,431 |
| 2005 | 798,245 | 1,147,287 | 132,781 | -1,107,044 | 93,557 | -89,923 | 974,902 |
| 2006 | 838,624 | 1,125,277 | 44,650 | -1,149,083 | 40,846 | -96,620 | 803,695 |
| 2007 | 560,409 | 403,611 | 26,256 | -2,095,098 | 17,882 | -91,605 | -1,178,546 |
| 2008 | 461,504 | 146,763 | 78,837 | -2,336,059 | 36,058 | -86,288 | -1,699,186 |
| 2009 | 485,046 | 186,548 | 73,844 | -2,195,945 | 21,586 | -85,741 | -1,514,667 |
| 2010 | 594,742 | 467,683 | 141,708 | -1,459,775 | 58,145 | -94,580 | -292,077 |
| 2011 | 1,073,691 | 1,530,123 | 259,377 | -983,811 | 118,303 | -94,899 | 1,902,783 |
| 2012 | 712,922 | 580,590 | 88,566 | -1,580,331 | 19,020 | -92,962 | -272,194 |
| 2013 | 536,928 | 156,704 | 59,470 | -2,441,173 | 19,043 | -83,437 | -1,752,473 |
| 2014 | 440,924 | 84,456 | 50,842 | -2,817,057 | 17,832 | -80,712 | -2,303,716 |
| 2015 | 427,452 | 89,744 | 42,671 | -2,723,229 | 21,338 | -68,221 | -2,210,242 |
| 2016 | 461,704 | 198,008 | 70,404 | -1,915,137 | 32,445 | -58,578 | -1,211,157 |
| 2017 | 958,482 | 1,879,808 | 216,262 | -1,338,694 | 85,850 | -66,413 | 1,735,294 |
| 2018 | 568,760 | 614,176 | 81,687 | -1,857,022 | 31,439 | -69,158 | -630,122 |
| 2019 | 766,599 | 1,291,624 | 80,305 | -1,293,508 | 67,452 | -69,164 | 843,311 |
| 2020 | 630,494 | 417,948 | 74,703 | -1,529,196 | 80,739 | -67,446 | -392,758 |
| 2021 | 485,299 | 122,423 | 48,451 | -2,446,495 | 65,814 | -68,453 | -1,792,961 |
| 2022 | 463,727 | 120,308 | 51,432 | -2,332,183 | 37,427 | -67,604 | -1,726,892 |
| 2023 | 1,111,864 | 1,848,866 | 192,914 | -925,464 | 135,451 | -74,277 | 2,289,354 |

NOTES:

| | |
|---|---|
| Deep Percolation | Precipitation and applied water that reaches the groundwater after simulated transport across the unsaturated zone |
| Managed Recharge and Canal Seepage | Combined groundwater recharge from managed aquifer recharge operations, groundwater banking, and seepage from canals and other conveyance |
| Net GW/SW Interactions | Net volumetric exchange of surface water and groundwater from streams: Positive represents a net groundwater |
| GW Pumping | Total groundwater pumping by wells. Groundwater banking recovery pumping is specified input whereas agricultural and municipal pumping is calculated by C2VSim based on demand |
| Small Watershed Inflow | Runoff and subsurface inflow from surrounding watersheds |
| Subsurface Flow with Adjacent GW Basins | Net subsurface groundwater flow from the Kern County Subbasin with an adjoining groundwater basin: negative is a net flow out of the Basin and positive is a net flow into the Basin |
| Change in Groundwater Storage | Sum of the inflow components (positive numbers) plus the outflow components (negative numbers): positive is an increase in storage typified by a rise in GW levels whereas a negative is a decrease in storage typified by a decline in GW levels |

**TABLE 12: Historical and Current Groundwater Recharge for WY1995 to WY2023**

| | Soil Moisture Percolation | | | | Groundwater Recharge | | | |
|---|---|---|---|---|---|---|---|---|
| Water Year | Percolation from Agricultural Area | Percolation from Urban Area | Percolation from Native, Undeveloped or Fallow Areas | Percolation to Unsaturated Zone | GW Recharge from Unsaturated Zone | GW Banking, Conjunctive Use and Other Managed Recharge | Net GW/SW Interactions | Total GW Recharge |
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| **SUMMARY: WY1995 to WY2022 Simulatation Period** | | | | | | | | |
| **Total** | 15,754,960 | 1,507,151 | 2,588,815 | 19,850,927 | 19,241,188 | 18,254,872 | 2,830,842 | 40,326,902 |
| **Average** | 543,274 | 51,971 | 89,269 | 684,515 | 663,489 | 629,478 | 97,615 | 1,390,583 |
| **Use (ft/acre)** | 0.70 | 0.54 | 0.10 | 0.38 | | | | |
| **Percent** | 79% | 8% | 13% | 100% | 48% | 45% | 7% | 100% |
| **SUMMARY: WY1995 to WY2014 Historical Period** | | | | | | | | |
| **Total** | 10,840,033 | 989,312 | 1,624,558 | 13,453,903 | 13,366,806 | 11,671,966 | 1,972,014 | 27,010,786 |
| **Average** | 542,002 | 49,466 | 81,228 | 672,695 | 668,340 | 583,598 | 98,601 | 1,350,539 |
| **Use (ft/acre)** | 0.70 | 0.52 | 0.09 | 0.37 | | | | |
| **Percent** | 81% | 7% | 12% | 100% | 49% | 43% | 7% | 100% |
| **SUMMARY: WY2016 to WY2022 Annual Report Period** | | | | | | | | |
| **Total** | 4,914,927 | 517,839 | 964,257 | 6,397,023 | 5,874,382 | 6,582,905 | 858,828 | 13,316,115 |
| **Average** | 546,103 | 57,538 | 107,140 | 710,780 | 652,709 | 731,434 | 95,425 | 1,479,568 |
| **Use (ft/acre)** | 0.70 | 0.60 | 0.12 | 0.39 | | | | |
| **Percent** | 77% | 8% | 15% | 100% | 44% | 49% | 6% | 100% |
| **Annual Simulation Results for WY2022 to WY2070 Simulation Period** | | | | | | | | |
| 1995 | 622,877 | 51,743 | 184,664 | 859,285 | 880,433 | 944,800 | 185,777 | 2,011,011 |
| 1996 | 572,216 | 42,250 | 72,348 | 686,814 | 801,525 | 926,537 | 106,693 | 1,834,755 |
| 1997 | 615,748 | 49,378 | 100,568 | 765,693 | 766,620 | 771,510 | 126,405 | 1,664,534 |
| 1998 | 675,008 | 76,104 | 259,287 | 1,010,398 | 1,034,825 | 1,097,180 | 121,413 | 2,253,418 |
| 1999 | 559,254 | 48,475 | 82,918 | 690,647 | 755,543 | 633,676 | 39,705 | 1,428,924 |
| 2000 | 516,121 | 40,343 | 49,112 | 605,575 | 616,913 | 462,522 | 91,455 | 1,170,889 |
| 2001 | 522,620 | 46,161 | 57,907 | 626,689 | 551,581 | 222,131 | 66,647 | 840,359 |
| 2002 | 450,599 | 37,043 | 43,583 | 531,224 | 466,234 | 202,687 | 76,147 | 745,068 |
| 2003 | 470,394 | 52,083 | 58,799 | 581,277 | 502,293 | 297,019 | 118,149 | 917,461 |
| 2004 | 484,857 | 49,885 | 53,868 | 588,609 | 487,803 | 284,862 | 83,292 | 855,957 |
| 2005 | 559,713 | 61,040 | 107,289 | 728,043 | 798,245 | 1,147,287 | 132,781 | 2,078,314 |
| 2006 | 541,188 | 54,732 | 56,803 | 652,723 | 838,624 | 1,125,277 | 44,650 | 2,008,552 |
| 2007 | 506,798 | 37,562 | 31,184 | 575,543 | 560,409 | 403,611 | 26,256 | 990,276 |
| 2008 | 497,075 | 35,748 | 38,461 | 571,285 | 461,504 | 146,763 | 78,837 | 687,104 |
| 2009 | 504,450 | 41,539 | 43,124 | 589,113 | 485,046 | 186,548 | 73,844 | 745,438 |
| 2010 | 525,792 | 61,001 | 85,901 | 672,695 | 594,742 | 467,683 | 141,708 | 1,204,134 |
| 2011 | 690,946 | 76,143 | 190,426 | 957,515 | 1,073,691 | 1,530,123 | 259,377 | 2,863,191 |
| 2012 | 562,482 | 55,571 | 40,582 | 658,635 | 712,922 | 580,590 | 88,566 | 1,382,078 |
| 2013 | 490,189 | 39,469 | 35,779 | 565,437 | 536,928 | 156,704 | 59,470 | 753,102 |
| 2014 | 471,707 | 33,042 | 31,955 | 536,705 | 440,924 | 84,456 | 50,842 | 576,222 |
| 2015 | 508,357 | 46,568 | 56,187 | 611,112 | 427,452 | 89,744 | 42,671 | 559,867 |
| 2016 | 487,538 | 47,479 | 70,079 | 605,096 | 461,704 | 198,008 | 70,404 | 730,116 |
| 2017 | 654,882 | 58,316 | 148,266 | 861,465 | 958,482 | 1,879,808 | 216,262 | 3,054,552 |
| 2018 | 461,003 | 37,368 | 42,571 | 540,942 | 568,760 | 614,176 | 81,687 | 1,264,622 |
| 2019 | 503,130 | 49,206 | 88,940 | 641,276 | 766,599 | 1,291,624 | 80,305 | 2,138,528 |
| 2020 | 563,821 | 67,782 | 150,431 | 782,035 | 630,494 | 417,948 | 74,703 | 1,123,145 |
| 2021 | 466,009 | 59,024 | 47,326 | 572,358 | 485,299 | 122,423 | 48,451 | 656,174 |
| 2022 | 535,494 | 58,881 | 77,701 | 672,076 | 463,727 | 120,308 | 51,432 | 635,467 |
| 2023 | 734,692 | 93,214 | 282,758 | 1,110,664 | 1,111,864 | 1,848,866 | 192,914 | 3,153,644 |

**NOTES:**

| | |
|---|---|
| **Simulation of Recharge** | IWFM applies two processes to simulate the movement of water from the surface to the groundwater. The root zone simulates calculates the volume of water that will percolate below the root zone based on local soil properties. This water bases to the unsaturated zone that applies a 1-D vadose zone flow that simulates the rate that water will reach the groundwater based on subsurface properties and soil moisture content. |
| **Percolation from Agricultural Area** | Total volume of rainfall and applied water calculated to meet the total agricultural demand that percolates below the root zone in irrigated agricultural areas based on C2VSim simulation. |
| **Percolation from Urban Area** | Total volume of rainfall and applied water calculated to meet urban outdoor use that percolates below the root zone in urban areas based on C2VSim simulation. |
| **Percolation from Native, Undeveloped or Fallow Areas** | Total volume of rainfall and applied water that percolates below the root zone in native, undeveloped and fallow areas based on C2VSim simulation. |
| **Percolation to Unsaturated Zone** | Total volume of rainfall and applied water that percolates below the root zone from all areas based on C2VSim simulation. |
| **GW Recharge from Unsaturated Zone** | Volume of water going from the unsaturated zone to groundwater |
| **GW Banking, Managed Recharge and Canal Seepage** | Managed aquifer recharge and groundwater banking is simulated in C2VSim by applying a high recoverable loss factor for surface water diversions. For Kern County, these operations generally assumes that 88% to 94% of surface water deliveries physically recharge groundwater. This recharge is applied directly to the groundwater without passing through the unsaturated zone. |
| **Total GW-Surface Water Flow Interactions** | Total of Net Stream GW/SW Interactions (from Kern River and Poso Creek) and Net Small Watershed recharge from surface water runoff surrounding Kern County Subbasin. A positive number is recharge, and a negative is groundwater discharge to the stream. This recharge is applied directly to the groundwater without passing through the unsaturated zone. |
| **Total GW Recharge** | Total volume to water reaching the groundwater as recharge |

## TABLE 13: Historical and Current Basin Boundary GW Flow for WY1995 to WY2023

| Water Year | Net North Basin Boundary GW Flow | Net White Wolf GW Flow | Net Basin Boundary GW Flow | Net Stream GW/SW Interaction | Net Small Watershed Recharge | Total Stream Recharge |
|---|---|---|---|---|---|---|
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| | | | | | | |
| **SUMMARY: WY1995 to WY2022 Simulatation Period** | | | | | | |
| **Total** | -2,571,367 | 220,450 | **-2,350,917** | 2,830,842 | 1,533,153 | **4,363,995** |
| **Average** | -88,668 | 7,602 | **-81,066** | 97,615 | 52,867 | **150,483** |
| **SUMMARY: WY1995 to WY2014 Historical Period** | | | | | | |
| **Total** | -1,865,112 | 123,509 | **-1,741,603** | 1,972,014 | 975,198 | **2,947,212** |
| **Average** | -93,256 | 6,175 | **-87,080** | 98,601 | 48,760 | **147,361** |
| **SUMMARY: WY2016 to WY2022 Annual Report Period** | | | | | | |
| **Total** | -706,255 | 96,941 | **-609,314** | 858,828 | 557,955 | **1,416,783** |
| **Average** | -78,473 | 10,771 | **-67,702** | 95,425 | 61,995 | **157,420** |
| | | | | | | |
| **Annual Simulation Results for WY2022 to WY2070 Simulation Period** | | | | | | |
| 1995 | -76,200 | 897 | -75,303 | 185,777 | 122,287 | 308,064 |
| 1996 | -82,226 | -2,462 | -84,688 | 106,693 | 41,190 | 147,883 |
| 1997 | -85,077 | -2,325 | -87,402 | 126,405 | 50,548 | 176,953 |
| 1998 | -82,840 | -4,720 | -87,561 | 121,413 | 155,312 | 276,726 |
| 1999 | -82,203 | -3,070 | -85,273 | 39,705 | 32,155 | 71,860 |
| 2000 | -82,193 | -1,621 | -83,813 | 91,455 | 25,956 | 117,411 |
| 2001 | -83,287 | 1,329 | -81,958 | 66,647 | 24,633 | 91,280 |
| 2002 | -90,844 | 6,901 | -83,943 | 76,147 | 18,882 | 95,029 |
| 2003 | -93,662 | 8,030 | -85,633 | 118,149 | 34,003 | 152,152 |
| 2004 | -96,834 | 7,571 | -89,263 | 83,292 | 27,959 | 111,251 |
| 2005 | -99,147 | 9,224 | -89,923 | 132,781 | 93,557 | 226,339 |
| 2006 | -102,065 | 5,445 | -96,620 | 44,650 | 40,846 | 85,496 |
| 2007 | -98,698 | 7,094 | -91,605 | 26,256 | 17,882 | 44,138 |
| 2008 | -100,626 | 14,338 | -86,288 | 78,837 | 36,058 | 114,895 |
| 2009 | -101,563 | 15,822 | -85,741 | 73,844 | 21,586 | 95,430 |
| 2010 | -110,388 | 15,808 | -94,580 | 141,708 | 58,145 | 199,853 |
| 2011 | -102,639 | 7,740 | -94,899 | 259,377 | 118,303 | 377,679 |
| 2012 | -101,707 | 8,745 | -92,962 | 88,566 | 19,020 | 107,585 |
| 2013 | -95,325 | 11,888 | -83,437 | 59,470 | 19,043 | 78,513 |
| 2014 | -97,588 | 16,876 | -80,712 | 50,842 | 17,832 | 68,674 |
| 2015 | -87,190 | 18,970 | -68,221 | 42,671 | 21,338 | 64,008 |
| 2016 | -78,823 | 20,246 | -58,578 | 70,404 | 32,445 | 102,849 |
| 2017 | -78,475 | 12,061 | -66,413 | 216,262 | 85,850 | 302,112 |
| 2018 | -75,800 | 6,642 | -69,158 | 81,687 | 31,439 | 113,125 |
| 2019 | -75,018 | 5,854 | -69,164 | 80,305 | 67,452 | 147,758 |
| 2020 | -74,163 | 6,716 | -67,446 | 74,703 | 80,739 | 155,442 |
| 2021 | -78,411 | 9,958 | -68,453 | 48,451 | 65,814 | 114,264 |
| 2022 | -77,685 | 10,081 | -67,604 | 51,432 | 37,427 | 88,860 |
| 2023 | -80,690 | 6,413 | -74,277 | 192,914 | 135,451 | 328,365 |

**NOTES:**

| | |
|---|---|
| **Net North Basin Boundary GW Flow** | Difference of simulated groundwater inflows and outflows along the northern Kern County Subbasin boundary with Kings and Tule Basins |
| **Net White Wolf GW Flow** | Difference of simulated groundwater inflows and outflows along the southern Kern County Subbasin boundary with White Wolf Basin |
| **Net Basin Boundary GW Flow** | Combined subsurface GW flow from Kern County Subbasin to Kings, Tule and White Wolf Basins |
| **Net Stream GW/SW Interaction** | Net volumetric exchange between surface water in Kern River or Poso Creek and the groundwater. A positive number is surface water to groundwater, and a negative is groundwater discharge to the stream. |
| **Net Small Watershed Recharge** | Groundwater recharge from surface water runoff from small watersheds surrounding the Kern County Subbasin |
| **Total Stream Recharge** | Total of Net Stream GW/SW Interactions and Net Small Watershed Recharge |

## TABLE 14: Historical and Current Land Use and Water Use for WY1995 to WY2023

| | Land Use Summary | | | | Groundwater Pumping Summary | | | | Surface Water Use Summary | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Year | Irrigated Agricultural Area | Urban Area | Native, Undeveloped or Fallow Area | Total Area | Agricultural Pumping | Urban Pumping | GW Banking, Exchanges and "Pump-Ins" | Total Pumping | Agricultural Surface Water Deliveries | Urban Surface Water Deliveries | Other Surface Water Deliveries | Total Surface Water Deliveries |
| Units | Acres | Acres | Acres | Acres | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| **SUMMARY: WY1995 to WY2022 Simulatation Period** | | | | | | | | | | | | |
| **Total** | | | | | 36,928,465 | 4,941,154 | 6,219,654 | 48,089,274 | 33,971,251 | 1,232,941 | 489,705 | 35,693,898 |
| **Average** | 773,643 | 98,525 | 930,751 | 1,802,919 | 1,273,395 | 170,385 | 214,471 | 1,658,251 | 1,171,422 | 42,515 | 16,886 | 1,230,824 |
| **Use (ft/acre)** | | | | | 1.65 | 1.73 | | 0.92 | 0.92 | 0.25 | 0.08 | 0.74 |
| **Percent** | 43% | 5% | 52% | 100% | 77% | 10% | 13% | 100% | 95% | 3% | 1% | 100% |
| **SUMMARY: WY1995 to WY2014 Historical Period** | | | | | | | | | | | | |
| **Total** | | | | | 24,754,927 | 3,522,916 | 3,450,504 | 31,728,347 | 24,644,409 | 827,781 | 340,492 | 25,812,682 |
| **Average** | 779,822 | 95,537 | 927,546 | 1,802,905 | 1,237,746 | 176,146 | 172,525 | 1,586,417 | 1,232,220 | 41,389 | 17,025 | 1,290,634 |
| **Use (ft/acre)** | | | | | 1.59 | 1.84 | | 0.88 | 1.00 | 0.23 | 0.10 | 0.81 |
| **Percent** | 43% | 5% | 51% | 100% | 78% | 11% | 11% | 100% | 95% | 3% | 1% | 100% |
| **SUMMARY: WY2016 to WY2022 Annual Report Period** | | | | | | | | | | | | |
| **Total** | | | | | 12,173,538 | 1,418,239 | 2,769,150 | 16,360,927 | 9,326,843 | 405,160 | 149,213 | 9,881,215 |
| **Average** | 759,910 | 105,165 | 937,874 | 1,802,949 | 1,352,615 | 157,582 | 307,683 | 1,817,881 | 1,036,316 | 45,018 | 16,579 | 1,097,913 |
| **Use (ft/acre)** | | | | | 1.78 | 1.50 | | 1.01 | 0.77 | 0.29 | 0.05 | 0.60 |
| **Percent** | 42% | 6% | 52% | 100% | 74% | 9% | 17% | 100% | 94% | 4% | 2% | 100% |
| **Annual Simulation Results for WY2022 to WY2070 Simulation Period** | | | | | | | | | | | | |
| 1995 | 780,803 | 58,394 | 963,756 | 1,802,952 | 779,673 | 150,518 | 15,347 | 945,538 | 1,340,982 | 26,158 | 11,953 | 1,379,093 |
| 1996 | 798,735 | 71,339 | 931,951 | 1,802,025 | 1,080,675 | 153,880 | 11,378 | 1,245,932 | 1,647,976 | 27,131 | 14,181 | 1,689,287 |
| 1997 | 801,583 | 86,428 | 914,941 | 1,802,951 | 888,848 | 166,617 | 11,397 | 1,066,862 | 1,651,899 | 18,447 | 18,036 | 1,688,382 |
| 1998 | 799,230 | 94,070 | 909,652 | 1,802,951 | 694,893 | 178,371 | 9,704 | 882,967 | 1,201,751 | 10,595 | 41,846 | 1,254,192 |
| 1999 | 803,474 | 85,993 | 913,484 | 1,802,951 | 929,262 | 166,608 | 11,406 | 1,107,275 | 1,426,302 | 25,916 | 12,051 | 1,464,270 |
| 2000 | 835,206 | 85,863 | 881,882 | 1,802,951 | 1,192,285 | 166,512 | 14,958 | 1,373,755 | 1,463,158 | 29,713 | 6,073 | 1,498,944 |
| 2001 | 799,553 | 84,609 | 918,789 | 1,802,951 | 1,466,045 | 176,849 | 191,841 | 1,834,735 | 963,498 | 27,451 | 11,359 | 1,002,308 |
| 2002 | 738,420 | 87,611 | 976,921 | 1,802,951 | 1,473,084 | 180,772 | 103,649 | 1,757,505 | 1,058,519 | 28,964 | 16,859 | 1,104,341 |
| 2003 | 757,372 | 92,311 | 953,269 | 1,802,951 | 1,200,365 | 180,388 | 110,568 | 1,491,321 | 1,202,558 | 30,901 | 15,075 | 1,248,534 |
| 2004 | 769,162 | 95,981 | 937,809 | 1,802,951 | 1,590,873 | 176,146 | 90,059 | 1,857,078 | 1,148,879 | 54,569 | 19,412 | 1,222,859 |
| 2005 | 766,330 | 101,332 | 935,290 | 1,802,951 | 856,825 | 158,215 | 92,005 | 1,107,044 | 1,337,381 | 41,964 | 18,466 | 1,397,811 |
| 2006 | 816,721 | 112,056 | 874,174 | 1,802,951 | 950,585 | 179,565 | 18,933 | 1,149,083 | 1,470,354 | 38,666 | 18,441 | 1,527,461 |
| 2007 | 792,925 | 106,463 | 903,563 | 1,802,951 | 1,592,711 | 189,287 | 313,101 | 2,095,098 | 1,118,253 | 53,104 | 17,009 | 1,188,366 |
| 2008 | 762,593 | 103,540 | 936,819 | 1,802,951 | 1,580,999 | 189,648 | 565,412 | 2,336,059 | 993,550 | 54,064 | 14,880 | 1,062,494 |
| 2009 | 763,660 | 103,826 | 935,466 | 1,802,953 | 1,546,574 | 180,147 | 469,225 | 2,195,945 | 992,759 | 56,466 | 16,276 | 1,065,502 |
| 2010 | 755,415 | 106,423 | 941,113 | 1,802,951 | 1,003,190 | 174,610 | 281,975 | 1,459,775 | 1,267,222 | 58,848 | 19,425 | 1,345,495 |
| 2011 | 782,699 | 107,810 | 912,442 | 1,802,951 | 761,163 | 188,255 | 34,393 | 983,811 | 1,491,540 | 61,797 | 20,310 | 1,573,648 |
| 2012 | 790,395 | 110,511 | 902,046 | 1,802,951 | 1,216,581 | 203,122 | 160,629 | 1,580,331 | 1,280,456 | 65,278 | 15,464 | 1,361,197 |
| 2013 | 759,168 | 104,354 | 939,430 | 1,802,951 | 1,936,008 | 179,416 | 325,749 | 2,441,173 | 923,115 | 64,303 | 20,333 | 1,007,751 |
| 2014 | 723,000 | 111,830 | 968,121 | 1,802,951 | 2,014,288 | 183,992 | 618,777 | 2,817,057 | 664,254 | 53,448 | 13,044 | 730,747 |
| 2015 | 765,851 | 111,658 | 925,424 | 1,802,933 | 1,989,237 | 166,575 | 567,417 | 2,723,229 | 606,865 | 43,170 | 7,816 | 657,851 |
| 2016 | 759,168 | 104,354 | 939,430 | 1,802,951 | 1,418,158 | 152,484 | 344,495 | 1,915,137 | 896,642 | 50,305 | 15,789 | 962,736 |
| 2017 | 759,168 | 104,354 | 939,430 | 1,802,951 | 1,118,615 | 160,601 | 59,478 | 1,338,694 | 1,492,979 | 50,166 | 19,755 | 1,562,900 |
| 2018 | 759,168 | 104,354 | 939,430 | 1,802,951 | 1,569,420 | 157,246 | 130,355 | 1,857,022 | 1,117,016 | 52,284 | 22,523 | 1,191,824 |
| 2019 | 759,168 | 104,354 | 939,430 | 1,802,951 | 1,095,966 | 150,892 | 46,650 | 1,293,508 | 1,348,900 | 49,085 | 19,114 | 1,417,099 |
| 2020 | 759,168 | 104,354 | 939,430 | 1,802,951 | 1,048,690 | 143,180 | 337,327 | 1,529,196 | 875,658 | 57,246 | 18,728 | 951,631 |

**TABLE 14: Historical and Current Land Use and Water Use for WY1995 to WY2023**

| | Land Use Summary | | | | Groundwater Pumping Summary | | | | Surface Water Use Summary | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Year | Irrigated Agricultural Area | Urban Area | Native, Undeveloped or Fallow Area | Total Area | Agricultural Pumping | Urban Pumping | GW Banking, Exchanges and "Pump-Ins" | Total Pumping | Agricultural Surface Water Deliveries | Urban Surface Water Deliveries | Other Surface Water Deliveries | Total Surface Water Deliveries |
| Units | Acres | Acres | Acres | Acres | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| 2021 | 759,168 | 104,354 | 939,430 | 1,802,951 | 1,801,556 | 166,249 | 478,690 | 2,446,495 | 659,029 | 34,516 | 15,869 | 709,414 |
| 2022 | 759,168 | 104,354 | 939,430 | 1,802,951 | 1,542,728 | 163,032 | 626,422 | 2,332,183 | 706,200 | 33,942 | 13,279 | 753,422 |
| 2023 | 759,168 | 104,354 | 939,430 | 1,802,951 | 589,169 | 157,979 | 178,315 | 925,464 | 1,623,553 | 34,446 | 16,340 | 1,674,340 |

**NOTES:**

| | |
|---|---|
| **Land Use Summary** | Total acreage assigned to irrigated agriculture, urban and native/riparian areas within the water budget area. Areas are based on Kern County land use data and mapped by DWR. Under future project scenarios, land use is modified to reflect demand reduction management actions. |
| **Agricultural Pumping** | Total agricultural pumping appliedin C2VSim to to meet irrigated agricultural demand |
| **Urban Pumping** | Total groundwater pumping applied to urban areas for municipal and industrial (M&I) use to meet the urban demand calculated by C2VSim |
| **GW Banking, Exchanges and "Pump-Ins"** | Total user-specified pumping for groundwater banking recovery operations, in-basin groundwater exchanges, aqueduct pump-ins, or specified urban pumping. A negative value represents an exchange where groundwater pumped from another area is applied within this area. |
| **Agricultural Surface Water Deliveries** | Amount of surface water delivered to meet crop water requirements for irrigated acreage after application of user define assumptions for canal seepage and evaporation loss |
| **Urban Surface Water Deliveries** | Amount of surface water delivered for urban (M&I) use after application of user-defined assumptions for canal seepage and evaporation loss |
| **Other Surface Water Deliveries** | Amount of surface water delivered for other uses (e.g. KNWR seasonal water supply) after application of user-defined assumptions for canal seepage and evaporation loss |

## TABLE 15: Historical and Current Agricultural Management Water Budget for WY1995 to WY2023

| | | Water Supply | | | | | Water Demand | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Irrigated Ag. Area** | **Precipitation to ET** | **Ag. Pumping Applied Water** | **Ag. Surface Water Deliveries** | **Precipitation to ET per Acre** | **Total Applied Water Per Acre** | **Crop Water Requirement** | **Percolation to Groundwater** | **Crop Water Demand Per Acre** | **Percolation to Groundwater per Acre** |
| Units | Acres | Acre-ft | Acre-ft | Acre-ft | ft/acre | ft/acre | Acre-ft | Acre-ft | ft/acre | ft/acre |
| **SUMMARY: WY1995 to WY2022 Simulatation Period** | | | | | | | | | | |
| **Total** | 22,435,635 | 9,937,217 | 36,914,949 | 33,971,251 | | | 62,342,147 | 15,754,960 | | |
| **Average** | 773,643 | 342,663 | 1,272,929 | 1,171,422 | 0.44 | 3.16 | 2,149,729 | 543,274 | 2.78 | 0.70 |
| **Percent** | | 12% | 46% | 42% | | | 80% | 20% | | |
| **SUMMARY: WY1995 to WY2014 Historical Period** | | | | | | | | | | |
| **Total** | 15,596,443 | 6,837,516 | 24,742,130 | 24,644,409 | | | 43,148,864 | 10,840,033 | | |
| **Average** | 779,822 | 341,876 | 1,237,106 | 1,232,220 | 0.44 | 3.17 | 2,157,443 | 542,002 | 2.77 | 0.69 |
| **Percent** | | 12% | 44% | 44% | | | 80% | 20% | | |
| **SUMMARY: WY2016 to WY2022 Annual Report Period** | | | | | | | | | | |
| **Total** | 6,839,192 | 3,099,700 | 12,172,819 | 9,326,843 | | | 19,193,283 | 4,914,927 | | |
| **Average** | 759,910 | 344,411 | 1,352,535 | 1,036,316 | 0.45 | 3.14 | 2,132,587 | 546,103 | 2.81 | 0.72 |
| **Percent** | | 13% | 49% | 38% | | | 80% | 20% | | |
| **Annual Simulation Results for WY2022 to WY2070 Simulation Period** | | | | | | | | | | |
| 1995 | 780,803 | 522,058 | 779,191 | 1,340,982 | 0.67 | 2.72 | 2,032,198 | 622,877 | 2.60 | 0.80 |
| 1996 | 798,735 | 351,541 | 1,079,730 | 1,647,976 | 0.44 | 3.42 | 2,333,516 | 572,216 | 2.92 | 0.72 |
| 1997 | 801,583 | 356,655 | 888,253 | 1,651,899 | 0.44 | 3.17 | 2,204,198 | 615,748 | 2.75 | 0.77 |
| 1998 | 799,230 | 663,771 | 694,449 | 1,201,751 | 0.83 | 2.37 | 2,019,673 | 675,008 | 2.53 | 0.84 |
| 1999 | 803,474 | 400,739 | 928,706 | 1,426,302 | 0.50 | 2.93 | 2,030,935 | 559,254 | 2.53 | 0.70 |
| 2000 | 835,206 | 357,513 | 1,191,773 | 1,463,158 | 0.43 | 3.18 | 2,307,050 | 516,121 | 2.76 | 0.62 |
| 2001 | 799,553 | 354,066 | 1,465,657 | 963,498 | 0.44 | 3.04 | 2,183,365 | 522,620 | 2.73 | 0.65 |
| 2002 | 738,420 | 227,944 | 1,472,518 | 1,058,519 | 0.31 | 3.43 | 2,167,372 | 450,599 | 2.94 | 0.61 |
| 2003 | 757,372 | 331,344 | 1,199,815 | 1,202,558 | 0.44 | 3.17 | 2,143,211 | 470,394 | 2.83 | 0.62 |
| 2004 | 769,162 | 275,311 | 1,590,290 | 1,148,879 | 0.36 | 3.56 | 2,336,680 | 484,857 | 3.04 | 0.63 |
| 2005 | 766,330 | 486,190 | 856,207 | 1,337,381 | 0.63 | 2.86 | 2,099,682 | 559,713 | 2.74 | 0.73 |
| 2006 | 816,721 | 447,335 | 949,943 | 1,470,354 | 0.55 | 2.96 | 2,155,061 | 541,188 | 2.64 | 0.66 |
| 2007 | 792,925 | 227,795 | 1,592,012 | 1,118,253 | 0.29 | 3.42 | 2,219,410 | 506,798 | 2.80 | 0.64 |
| 2008 | 762,593 | 170,753 | 1,580,341 | 993,550 | 0.22 | 3.38 | 2,099,516 | 497,075 | 2.75 | 0.65 |
| 2009 | 763,660 | 221,537 | 1,545,851 | 992,759 | 0.29 | 3.32 | 2,119,774 | 504,450 | 2.78 | 0.66 |
| 2010 | 755,415 | 346,164 | 1,002,454 | 1,267,222 | 0.46 | 3.00 | 2,030,802 | 525,792 | 2.69 | 0.70 |
| 2011 | 782,699 | 441,708 | 760,475 | 1,491,540 | 0.56 | 2.88 | 2,029,584 | 690,946 | 2.59 | 0.88 |
| 2012 | 790,395 | 299,286 | 1,215,834 | 1,280,456 | 0.38 | 3.16 | 2,054,929 | 562,482 | 2.60 | 0.71 |
| 2013 | 759,168 | 203,135 | 1,935,161 | 923,115 | 0.27 | 3.77 | 2,387,228 | 490,189 | 3.14 | 0.65 |
| 2014 | 723,000 | 152,673 | 2,013,469 | 664,254 | 0.21 | 3.70 | 2,194,681 | 471,707 | 3.04 | 0.65 |
| 2015 | 765,851 | 253,389 | 1,988,524 | 606,865 | 0.33 | 3.39 | 2,229,085 | 508,357 | 2.91 | 0.66 |
| 2016 | 759,168 | 367,342 | 1,418,151 | 896,642 | 0.48 | 3.05 | 2,155,481 | 487,538 | 2.84 | 0.64 |
| 2017 | 759,168 | 402,750 | 1,118,615 | 1,492,979 | 0.53 | 3.44 | 2,369,543 | 654,882 | 3.12 | 0.86 |
| 2018 | 759,168 | 241,214 | 1,569,420 | 1,117,016 | 0.32 | 3.54 | 2,305,588 | 461,003 | 3.04 | 0.61 |
| 2019 | 759,168 | 432,798 | 1,095,966 | 1,348,900 | 0.57 | 3.22 | 2,338,252 | 503,130 | 3.08 | 0.66 |
| 2020 | 759,168 | 435,183 | 1,048,690 | 875,658 | 0.57 | 2.53 | 1,821,644 | 563,821 | 2.40 | 0.74 |
| 2021 | 759,168 | 220,670 | 1,801,556 | 659,029 | 0.29 | 3.24 | 2,089,943 | 466,009 | 2.75 | 0.61 |
| 2022 | 759,168 | 235,251 | 1,542,728 | 706,200 | 0.31 | 2.96 | 1,895,235 | 535,494 | 2.50 | 0.71 |
| 2023 | 759,168 | 511,102 | 589,169 | 1,623,553 | 0.67 | 2.91 | 1,988,513 | 734,692 | 2.62 | 0.97 |

**NOTES:**

| | |
|---|---|
| **Irrigated Ag. Area** | Total irrigated agricultural acreage within the water budget area input into C2VSim based on Kern County Agriculture Commission data and mapped by DWR |
| **Precipitation to ET** | Amount of precipitation that meets ET demand as calculated by C2VSim over the entire year. This includes ET losses that occur outside of normal growing season so differs from Effective Precipitation as commonly applied in Agriculture Management Plans. |
| **Ag. Pumping Applied Water** | Amount of pumped groundwater applied to total irrigated acreage to meet C2VSim calculated crop water and deep percolation demand after application of effective precipitation and surface water deliveries. |
| **Ag. Surface Water Deliveries** | Amount of surface water delivered to the total irrigated acreage to meet the C2VSim calculated crop water and deep percolation demand. Applied deliveries include recoverable loss (canal seepage) and non-recoverable loss (evaporation, other losses) factors, based on local conditions and applied consistently with DWR approach used in C2VSim, to the total surface water delivery input data. |
| **Precipitation to ET per Acre** | Ratio of precipitation to meet ET demand to the total irrigated agricultural area |
| **Total Applied Water Per Acre** | Ratio of applied pumped groundwater and surface water deliveries to the irrigated agricultural area |

## TABLE 15: Historical and Current Agricultural Management Water Budget for WY1995 to WY2023

| | | Water Supply | | | | | Water Demand | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Water Year | Irrigated Ag. Area | Precipitation to ET | Ag. Pumping Applied Water | Ag. Surface Water Deliveries | Precipitation to ET per Acre | Total Applied Water Per Acre | Crop Water Requirement | Percolation to Groundwater | Crop Water Demand Per Acre | Percolation to Groundwater per Acre |
| Units | Acres | Acre-ft | Acre-ft | Acre-ft | ft/acre | ft/acre | Acre-ft | Acre-ft | ft/acre | ft/acre |

| | |
|---|---|
| **Crop Water Requirement** | Volume of water needed to meet the C2VSim calculated crop demand based on application of METRIC ET data over the irrigated agricultural area |
| **Percolation to Groundwater** | Total volume of rainfall and applied water that percolates below the root zone based on C2VSim simulation. This water then enters the unsaturated zone where the time to reach the groundwater is calculated. |
| **Crop Water Demand Per Acre** | Ratio of the crop water requirement to the total irrigated agricultural area |
| **Percolation to Groundwater per Acre** | Ratio of percolation to groundwater to the total irrigated agricultural area |

## TABLE 16: Historical and Current Urban Water Budget for WY1995 to WY2023

| | | Water Supply | | | | | Water Demand | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Urban Area** | **Precipitation to ET** | **Urban Pumping** | **Urban Surface Water Deliveries** | **Precipitation to ET per Acre** | **Total Urban Water** | **Indoor Use** | **Outdoor Use** | **Runoff** | **Percolation to Groundwater per Acre** |
| Units | Acres | Acre-ft | Acre-ft | Acre-ft | ft/acre | ft/acre | Acre-ft | Acre-ft | ft/acre | ft/acre |
| **SUMMARY: WY1995 to WY2022 Simulatation Period** | | | | | | | | | | |
| **Total** | 2,857,232 | 1,664,480 | 4,941,154 | 1,232,941 | | 7,838,575 | 2,963,593 | 4,168,464 | | |
| **Average** | 98,525 | 57,396 | 170,385 | 42,515 | 0.59 | 270,296 | 102,193 | 143,740 | 24,362.71 | 270,295.71 |
| **Percent** | | 21% | 63% | 16% | | | 42% | 58% | | |
| **SUMMARY: WY1995 to WY2014 Historical Period** | | | | | | | | | | |
| **Total** | 1,910,744 | 1,067,687 | 3,522,916 | 827,781 | | | 2,088,556 | 2,875,610 | | |
| **Average** | 95,537 | 53,384 | 176,146 | 41,389 | 0.57 | 270,919 | 104,428 | 143,780 | 22,710.92 | 270,919.21 |
| **Percent** | | 20% | 65% | 15% | | | 42% | 58% | | |
| **SUMMARY: WY2016 to WY2022 Annual Report Period** | | | | | | | | | | |
| **Total** | 946,488 | 596,793 | 1,418,239 | 405,160 | | | 875,037 | 1,292,854 | | |
| **Average** | 105,165 | 66,310 | 157,582 | 45,018 | 0.63 | 268,910 | 97,226 | 143,650 | 28,033.34 | 268,910.15 |
| **Percent** | | 25% | 59% | 17% | | | 40% | 60% | | |
| **Annual Simulation Results for WY2022 to WY2070 Simulation Period** | | | | | | | | | | |
| 1995 | 58,394 | 55,288 | 150,518 | 26,158 | 0.95 | 231,964 | 84,694 | 122,429 | 24,840 | 231,964 |
| 1996 | 71,339 | 37,199 | 153,880 | 27,131 | 0.52 | 218,209 | 86,772 | 115,875 | 15,562 | 218,209 |
| 1997 | 86,428 | 54,682 | 166,617 | 18,447 | 0.63 | 239,746 | 88,716 | 127,843 | 23,188 | 239,746 |
| 1998 | 94,070 | 135,191 | 178,371 | 10,595 | 1.44 | 324,157 | 90,586 | 167,505 | 66,065 | 324,157 |
| 1999 | 85,993 | 49,179 | 166,608 | 25,916 | 0.57 | 241,703 | 92,291 | 128,353 | 21,059 | 241,703 |
| 2000 | 85,863 | 39,834 | 166,512 | 29,713 | 0.46 | 236,058 | 94,051 | 126,258 | 15,749 | 236,058 |
| 2001 | 84,609 | 46,629 | 176,849 | 27,451 | 0.55 | 250,929 | 99,017 | 132,780 | 19,133 | 250,929 |
| 2002 | 87,611 | 31,731 | 180,772 | 28,964 | 0.36 | 241,467 | 102,006 | 127,320 | 12,142 | 241,467 |
| 2003 | 92,311 | 47,646 | 180,388 | 30,901 | 0.52 | 258,936 | 101,561 | 138,871 | 18,504 | 258,936 |
| 2004 | 95,981 | 39,682 | 176,146 | 54,569 | 0.41 | 270,397 | 110,825 | 143,958 | 15,614 | 270,397 |
| 2005 | 101,332 | 88,860 | 158,215 | 41,964 | 0.88 | 289,038 | 95,953 | 156,283 | 36,802 | 289,038 |
| 2006 | 112,056 | 65,271 | 179,565 | 38,666 | 0.58 | 283,502 | 104,607 | 152,330 | 26,564 | 283,502 |
| 2007 | 106,463 | 30,955 | 189,287 | 53,104 | 0.29 | 273,346 | 116,192 | 145,343 | 11,810 | 273,346 |
| 2008 | 103,540 | 25,314 | 189,648 | 54,064 | 0.24 | 269,026 | 116,815 | 142,447 | 9,764 | 269,026 |
| 2009 | 103,826 | 38,910 | 180,147 | 56,466 | 0.37 | 275,523 | 113,421 | 147,203 | 14,899 | 275,523 |
| 2010 | 106,423 | 68,608 | 174,610 | 58,848 | 0.64 | 302,066 | 111,902 | 162,146 | 28,019 | 302,066 |
| 2011 | 107,810 | 104,506 | 188,255 | 61,797 | 0.97 | 354,559 | 119,859 | 181,928 | 52,772 | 354,559 |
| 2012 | 110,511 | 47,492 | 203,122 | 65,278 | 0.43 | 315,891 | 128,651 | 168,644 | 18,597 | 315,891 |
| 2013 | 104,354 | 32,230 | 179,416 | 64,303 | 0.31 | 275,948 | 116,820 | 146,849 | 12,279 | 275,948 |
| 2014 | 111,830 | 28,479 | 183,992 | 53,448 | 0.25 | 265,919 | 113,818 | 141,247 | 10,855 | 265,919 |
| 2015 | 111,658 | 51,792 | 166,575 | 43,170 | 0.46 | 261,537 | 100,535 | 140,445 | 20,556 | 261,537 |
| 2016 | 104,354 | 59,438 | 152,484 | 50,305 | 0.57 | 262,226 | 97,533 | 141,722 | 22,972 | 262,226 |
| 2017 | 104,354 | 86,197 | 160,601 | 50,166 | 0.83 | 296,965 | 101,073 | 157,367 | 38,525 | 296,965 |
| 2018 | 104,354 | 38,636 | 157,246 | 52,284 | 0.37 | 248,166 | 100,470 | 131,466 | 16,230 | 248,166 |
| 2019 | 104,354 | 77,523 | 150,892 | 49,085 | 0.74 | 277,500 | 95,855 | 149,894 | 31,751 | 277,500 |
| 2020 | 104,354 | 89,408 | 143,180 | 57,246 | 0.86 | 289,834 | 96,588 | 155,311 | 37,935 | 289,834 |
| 2021 | 104,354 | 29,391 | 166,249 | 34,516 | 0.28 | 230,155 | 96,328 | 122,623 | 11,204 | 230,155 |
| 2022 | 104,354 | 45,611 | 163,032 | 33,942 | 0.44 | 242,586 | 94,406 | 129,303 | 18,877 | 242,586 |
| 2023 | 104,354 | 118,797 | 157,979 | 34,446 | 1.14 | 311,223 | 92,249 | 164,724 | 54,250 | 311,223 |

**NOTES:**

| | |
|---|---|
| **Irrigated Ag. Area** | Total irrigated agricultural acreage within the water budget area input into C2VSim based on Kern County Agriculture Commission data and mapped by DWR |
| **Precipitation to ET** | Amount of precipitation that meets ET demand as calculated by C2VSim over the entire year. This includes ET losses that occur outside of normal growing season so differs from Effective Precipitation as commonly applied in Agriculture Management Plans. |
| **Ag. Pumping Applied Water** | Amount of pumped groundwater applied to total irrigated acreage to meet C2VSim calculated crop water and deep percolation demand after application of effective precipitation and surface water deliveries. |
| **Ag. Surface Water Deliveries** | Amount of surface water delivered to the total irrigated acreage to meet the C2VSim calculated crop water and deep percolation demand. Applied deliveries include recoverable loss (canal seepage) and non-recoverable loss (evaporation, other losses) factors, based on local conditions and applied consistently with DWR approach used in C2VSim, to the total surface water delivery input data. |
| **Precipitation to ET per Acre** | Ratio of precipitation to meet ET demand to the total irrigated agricultural area |

**TABLE 16: Historical and Current Urban Water Budget for WY1995 to WY2023**

| | | Water Supply | | | | | Water Demand | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Urban Area** | **Precipitation to ET** | **Urban Pumping** | **Urban Surface Water Deliveries** | **Precipitation to ET per Acre** | **Total Urban Water** | **Indoor Use** | **Outdoor Use** | **Runoff** | **Percolation to Groundwater per Acre** |
| Units | Acres | Acre-ft | Acre-ft | Acre-ft | ft/acre | ft/acre | Acre-ft | Acre-ft | ft/acre | ft/acre |

| | |
|---|---|
| **Total Applied Water Per Acre** | Ratio of applied pumped groundwater and surface water deliveries to the irrigated agricultural area |
| **Crop Water Requirement** | Volume of water needed to meet the C2VSim calculated crop demand based on application of METRIC ET data over the irrigated agricultural area |
| **Percolation to Groundwater** | Total volume of rainfall and applied water that percolates below the root zone based on C2VSim simulation. This water then enters the unsaturated zone where the time to reach the groundwater is calculated. |
| **Crop Water Demand Per Acre** | Ratio of the crop water requirement to the total irrigated agricultural area |
| **Percolation to Groundwater per Acre** | Ratio of percolation to groundwater to the total irrigated agricultural area |

## TABLE 17: Estimate of potential native yield for Kern County Subbasin for WY1995 to WY2023 based on C2VSimFG-Kern Historical Simulation

| | Ag Precipitation Recharge | | | Other Area Precipitation Recharge | | | Small Watershed Inflows | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Precipitation in Agricultural Area** | **Precipitation to ET Demand** | **Precipitation to Groundwater in Agricultural Area** | **Precipitation in Other Areas** | **Precipitation to ET Demand** | **Precipitation to Groundwater in Other Areas** | **Small Watershed Subsurface Inflow** | **Small Watershed Runoff Percolation** | **Small Watershed Recharge to Groundwater** | **Native Yield** |
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| | | | | | | | | | | |
| **SUMMARY: WY1995 to WY2022 Simulatation Period** | | | | | | | | | | |
| **Total** | 12,462,979 | 9,937,217 | 2,525,762 | 18,250,074 | 13,437,807 | 4,812,267 | 515,294 | 1,017,859 | 1,533,153 | |
| **Average** | 429,758 | 342,663 | 87,095 | 629,313 | 463,373 | 165,940 | 17,769 | 35,099 | 52,867 | 305,903 |
| **Use (ft/acre)** | 0.56 | 0.44 | 0.11 | 0.61 | 0.45 | 0.16 | 0.01 | 0.02 | 0.03 | 0.170 |
| **SUMMARY: WY1995 to WY2014 Historical Period** | | | | | | | | | | |
| **Total** | 8,391,861 | 6,837,516 | 1,554,344 | 12,161,462 | 9,075,923 | 3,085,539 | 354,429 | 620,769 | 975,198 | |
| **Average** | 419,593 | 341,876 | 77,717 | 608,073 | 453,796 | 154,277 | 17,721 | 31,038 | 48,760 | 280,754 |
| **Percent** | 0.54 | 0.44 | 0.10 | 0.59 | 0.44 | 0.15 | 0.01 | 0.02 | 0.03 | 0.156 |
| **SUMMARY: WY2016 to WY2022 Current Period** | | | | | | | | | | |
| **Total** | 4,071,118 | 3,099,700 | 971,418 | 6,088,612 | 4,361,885 | 1,726,727 | 160,865 | 397,090 | 557,955 | |
| **Average** | 452,346 | 344,411 | 107,935 | 676,512 | 484,654 | 191,859 | 17,874 | 44,121 | 61,995 | 361,789 |
| **Percent** | 0.60 | 0.45 | 0.14 | 0.65 | 0.46 | 0.18 | 0.01 | 0.02 | 0.03 | 0.201 |
| | | | | | | | | | | |
| **Annual Simulation Results for WY2022 to WY2070 Simulation Period** | | | | | | | | | | |
| 1995 | 702,840 | 522,058 | 180,783 | 1,108,386 | 801,551 | 306,835 | 17,540 | 104,746 | 122,287 | 592,364 |
| 1996 | 381,509 | 351,541 | 29,968 | 526,809 | 406,953 | 119,856 | 17,512 | 23,679 | 41,190 | 173,502 |
| 1997 | 482,141 | 356,655 | 125,486 | 637,266 | 466,082 | 171,184 | 17,524 | 33,024 | 50,548 | 329,693 |
| 1998 | 966,577 | 663,771 | 302,806 | 1,492,576 | 981,363 | 511,212 | 17,840 | 137,472 | 155,312 | 951,491 |
| 1999 | 433,488 | 400,739 | 32,750 | 589,454 | 443,615 | 145,839 | 17,812 | 14,343 | 32,155 | 192,931 |
| 2000 | 384,165 | 357,513 | 26,653 | 476,308 | 379,027 | 97,281 | 17,757 | 8,200 | 25,956 | 132,133 |
| 2001 | 431,785 | 354,066 | 77,719 | 579,440 | 467,082 | 112,358 | 17,722 | 6,911 | 24,633 | 196,988 |
| 2002 | 255,112 | 227,944 | 27,168 | 382,463 | 302,828 | 79,635 | 17,679 | 1,203 | 18,882 | 108,006 |
| 2003 | 400,954 | 331,344 | 69,610 | 599,314 | 487,243 | 112,071 | 17,683 | 16,320 | 34,003 | 198,002 |
| 2004 | 301,026 | 275,311 | 25,715 | 422,514 | 323,616 | 98,898 | 17,661 | 10,298 | 27,959 | 134,911 |
| 2005 | 653,857 | 486,190 | 167,667 | 964,382 | 750,845 | 213,537 | 17,808 | 75,750 | 93,557 | 456,954 |
| 2006 | 499,759 | 447,335 | 52,424 | 657,647 | 520,211 | 137,436 | 17,783 | 23,063 | 40,846 | 212,923 |
| 2007 | 216,658 | 227,795 | -11,137 | 292,814 | 227,713 | 65,101 | 17,725 | 157 | 17,882 | 54,121 |
| 2008 | 189,038 | 170,753 | 18,285 | 305,703 | 236,546 | 69,158 | 17,697 | 18,361 | 36,058 | 105,804 |
| 2009 | 268,030 | 221,537 | 46,493 | 405,160 | 319,141 | 86,019 | 17,674 | 3,913 | 21,586 | 136,425 |
| 2010 | 457,048 | 346,164 | 110,884 | 683,456 | 517,797 | 165,659 | 17,731 | 40,414 | 58,145 | 316,956 |
| 2011 | 649,894 | 441,708 | 208,186 | 1,023,701 | 657,443 | 366,257 | 17,932 | 100,370 | 118,303 | 674,814 |
| 2012 | 335,229 | 299,286 | 35,943 | 446,686 | 353,433 | 93,253 | 17,851 | 1,169 | 19,020 | 130,365 |
| 2013 | 214,952 | 203,135 | 11,818 | 303,560 | 232,284 | 71,276 | 17,787 | 1,257 | 19,043 | 84,351 |
| 2014 | 167,797 | 152,673 | 15,124 | 263,824 | 201,150 | 62,674 | 17,713 | 120 | 17,832 | 77,917 |
| 2015 | 322,064 | 253,389 | 68,675 | 475,114 | 362,579 | 112,535 | 17,681 | 3,657 | 21,338 | 184,867 |
| 2016 | 451,531 | 367,342 | 84,189 | 631,136 | 494,509 | 136,627 | 17,714 | 14,732 | 32,445 | 235,548 |
| 2017 | 581,280 | 402,750 | 178,530 | 901,917 | 627,000 | 274,917 | 17,850 | 68,000 | 85,850 | 521,447 |
| 2018 | 258,498 | 241,214 | 17,283 | 380,004 | 291,885 | 88,120 | 17,762 | 13,677 | 31,439 | 119,079 |
| 2019 | 555,843 | 432,798 | 123,045 | 823,825 | 640,893 | 182,932 | 17,799 | 49,653 | 67,452 | 355,630 |
| 2020 | 600,038 | 435,183 | 164,855 | 893,992 | 636,897 | 257,095 | 17,895 | 62,844 | 80,739 | 484,794 |
| 2021 | 219,631 | 220,670 | -1,039 | 331,802 | 251,357 | 80,445 | 17,940 | 47,874 | 65,814 | 127,279 |
| 2022 | 322,956 | 235,251 | 87,704 | 477,061 | 345,192 | 131,869 | 17,949 | 19,478 | 37,427 | 239,051 |
| 2023 | 759,278 | 511,102 | 248,175 | 1,173,761 | 711,573 | 462,189 | 18,274 | 117,177 | 135,451 | 827,541 |

**NOTES:**

| | |
|---|---|
| **Simulation of Recharge** | IWFM applies two processes to simulate the movement of water from the surface to the groundwater. The root zone simulates calculates the volume of water that will percolate below the root zone based on local soil properties. This water bases to the unsaturated zone that applies a 1-D vadose zone flow that simulates the rate that water will reach the groundwater based on subsurface properties and soil moisture content. |
| **Percolation from Agricultural Area** | Total volume of rainfall and applied water calculated to meet the total agricultural demand that percolates below the root zone in irrigated agricultural areas based on C2VSim simulation. |
| **Percolation from Urban Area** | Total volume of rainfall and applied water calculated to meet urban outdoor use that percolates below the root zone in urban areas based on C2VSim simulation. |
| **Percolation from Native, Undeveloped or Fallow Areas** | Total volume of rainfall and applied water that percolates below the root zone in native, undeveloped and fallow areas based on C2VSim simulation. |
| **Percolation to Unsaturated Zone** | Total volume of rainfall and applied water that percolates below the root zone from all areas based on C2VSim simulation. |
| **GW Recharge from Unsaturated Zone** | Volume of water going from the unsaturated zone to groundwater |
| **GW Banking, Managed Recharge and Canal Seepage** | Managed aquifer recharge and groundwater banking is simulated in C2VSim by applying a high recoverable loss factor for surface water diversions. For Kern County, these operations generally assumes that 88% to 94% of surface water deliveries physically recharge groundwater. This recharge is applied directly to the groundwater without passing through the unsaturated zone. |
| **Net GW/SW Interactions** | Net volumetric exchange between surface water in Kern River or Poso Creek and the groundwater. A positive number is surface water to groundwater, and a negative is groundwater discharge to the stream. This recharge is applied directly to the groundwater without passing through the unsaturated zone. |
| **Total GW Recharge** | Total volume to water reaching the groundwater as recharge |

## Table 18 - Hydrologic year correlation with relevant river indices for projected-future simulation period

| Project Year | Hydrology Year | Annual Kern River Index | San Joaquin River Index |
|---|---|---|---|
| 2021 | **2003** | 71 | Below Normal |
| 2022 | **2004** | 56 | Dry |
| 2023 | **2005** | 159 | Wet |
| 2024 | **2006** | 147 | Wet |
| 2025 | **2007** | 35 | Critical |
| 2026 | **2008** | 71 | Critical |
| 2027 | **2009** | 65 | Below Normal |
| 2028 | **2010** | 126 | Above Normal |
| 2029 | **2011** | 201 | Wet |
| 2030 | **2012** | 45 | Dry |
| 2031 | **2013** | 28 | Critical |
| 2032 | **2014** | 24 | Critical |
| 2033 | **1995** | 191 | Wet |
| 2034 | **1996** | 136 | Wet |
| 2035 | **1997** | 162 | Wet |
| 2036 | **1998** | 236 | Wet |
| 2037 | **1999** | 60 | Above Normal |
| 2038 | **2000** | 66 | Above Normal |
| 2039 | **2001** | 54 | Dry |
| 2040 | **2002** | 58 | Dry |
| 2041 | **2003** | 71 | Below Normal |
| 2042 | **2004** | 56 | Dry |
| 2043 | **2005** | 159 | Wet |
| 2044 | **2006** | 147 | Wet |
| 2045 | **2007** | 35 | Critical |
| 2046 | **2008** | 71 | Critical |
| 2047 | **2009** | 65 | Below Normal |
| 2048 | **2010** | 126 | Above Normal |
| 2049 | **2011** | 201 | Wet |
| 2050 | **2012** | 45 | Dry |
| 2051 | **2013** | 28 | Critical |
| 2052 | **2014** | 24 | Critical |
| 2053 | **1995** | 191 | Wet |
| 2054 | **1996** | 136 | Wet |
| 2055 | **1997** | 162 | Wet |
| 2056 | **1998** | 236 | Wet |
| 2057 | **1999** | 60 | Above Normal |
| 2058 | **2000** | 66 | Above Normal |
| 2059 | **2001** | 54 | Dry |
| 2060 | **2002** | 58 | Dry |
| 2061 | **2003** | 71 | Below Normal |
| 2062 | **2004** | 56 | Dry |
| 2063 | **2005** | 159 | Wet |
| 2064 | **2006** | 147 | Wet |
| 2065 | **2007** | 35 | Critical |
| 2066 | **2008** | 71 | Critical |
| 2067 | **2009** | 65 | Below Normal |
| 2068 | **2010** | 126 | Above Normal |
| 2069 | **2011** | 201 | Wet |
| 2070 | **2012** | 45 | Dry |

## Table 19 - Projected Future Groundwater Budget for Kern County Subbasin under Baseline Conditions with NO SGMA Projects based on C2VSimFG-Kern Simulation

| Water Year | Deep Percolation | Managed Recharge and Canal Seepage | Net Stream GW/SW Interaction | Net Small Watershed Recharge | GW Pumping | Subsurface Flow with Adjacent GW Basins | Change in Groundwater Storage |
|---|---|---|---|---|---|---|---|
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| | | | | | | | |
| **SUMMARY: WY2021 to WY2070 Simulatation Period** | | | | | | | |
| **Total** | 31,276,668 | 27,591,218 | 6,284,636 | 2,457,805 | -80,359,227 | -3,647,996 | **-16,396,918** |
| **Average** | 625,533 | 551,824 | 125,693 | 49,156 | -1,607,185 | -72,960 | **-327,938** |
| **SUMMARY: WY2021 to WY2040 Implementation Period** | | | | | | | |
| **Total** | 12,059,157 | 10,900,930 | 2,570,048 | 948,239 | -31,618,403 | -1,527,102 | **-6,667,151** |
| **Average** | 602,958 | 545,046 | 128,502 | 47,412 | -1,580,920 | -76,355 | **-333,358** |
| **SUMMARY: WY2041 to WY2070 Sustainability Period** | | | | | | | |
| **Total** | 19,217,510 | 16,690,288 | 3,714,588 | 1,509,566 | -48,740,823 | -2,120,894 | **-9,729,767** |
| **Average** | 640,584 | 556,343 | 123,820 | 50,319 | -1,624,694 | -70,696 | **-324,326** |
| | | | | | | | |
| **Annual Simulation Results for WY2021 to WY2070 Simulation Period** | | | | | | | |
| 2021 | 421,248 | 253,922 | 124,080 | 38,770 | -1,605,058 | -83,845 | -850,883 |
| 2022 | 466,065 | 311,661 | 80,807 | 28,596 | -1,881,001 | -79,540 | -1,073,415 |
| 2023 | 670,267 | 894,337 | 186,631 | 97,803 | -1,082,942 | -77,289 | 688,801 |
| 2024 | 782,933 | 971,636 | 250,700 | 67,141 | -1,004,008 | -81,747 | 986,650 |
| 2025 | 487,829 | 334,264 | 74,696 | 18,060 | -1,956,094 | -78,483 | -1,119,730 |
| 2026 | 440,342 | 154,936 | 78,551 | 36,473 | -2,258,997 | -69,511 | -1,618,207 |
| 2027 | 522,430 | 255,426 | 73,629 | 21,942 | -1,995,091 | -69,397 | -1,191,063 |
| 2028 | 569,509 | 496,227 | 141,957 | 35,496 | -1,490,383 | -70,383 | -317,575 |
| 2029 | 1,025,597 | 1,528,921 | 110,823 | 119,558 | -891,968 | -80,187 | 1,812,744 |
| 2030 | 692,430 | 587,522 | 63,468 | 19,157 | -1,382,783 | -79,634 | -99,841 |
| 2031 | 550,146 | 164,041 | 109,295 | 19,161 | -2,366,434 | -73,780 | -1,597,574 |
| 2032 | 459,496 | 111,528 | 66,581 | 18,134 | -2,763,485 | -65,268 | -2,173,015 |
| 2033 | 742,600 | 875,129 | 188,075 | 126,420 | -1,059,514 | -71,675 | 801,034 |
| 2034 | 617,059 | 786,754 | 201,477 | 42,156 | -1,422,316 | -78,762 | 146,370 |
| 2035 | 691,055 | 727,363 | 294,732 | 52,652 | -1,120,121 | -82,586 | 563,094 |
| 2036 | 848,018 | 1,151,100 | 175,108 | 103,683 | -890,760 | -84,597 | 1,302,552 |
| 2037 | 617,636 | 539,499 | 102,463 | 32,114 | -1,230,808 | -82,549 | -21,645 |
| 2038 | 517,060 | 379,550 | 106,226 | 26,241 | -1,390,747 | -77,398 | -439,070 |
| 2039 | 495,144 | 190,829 | 65,868 | 25,370 | -1,883,912 | -72,405 | -1,179,106 |
| 2040 | 442,293 | 186,285 | 74,884 | 19,311 | -1,941,979 | -68,067 | -1,287,273 |
| 2041 | 466,980 | 254,002 | 124,912 | 34,980 | -1,621,935 | -66,834 | -807,894 |
| 2042 | 519,154 | 311,722 | 81,095 | 28,467 | -1,928,066 | -66,378 | -1,054,007 |
| 2043 | 723,193 | 894,377 | 183,602 | 100,835 | -1,131,893 | -66,724 | 703,389 |
| 2044 | 829,429 | 971,656 | 217,998 | 68,630 | -1,055,212 | -73,234 | 959,267 |
| 2045 | 520,072 | 334,263 | 67,722 | 18,136 | -2,005,971 | -71,742 | -1,137,519 |
| 2046 | 465,742 | 154,936 | 78,954 | 36,599 | -2,308,492 | -64,094 | -1,636,355 |
| 2047 | 542,433 | 255,426 | 73,991 | 22,117 | -2,044,767 | -65,020 | -1,215,821 |
| 2048 | 587,534 | 496,227 | 142,442 | 35,645 | -1,539,937 | -66,665 | -344,754 |
| 2049 | 1,038,285 | 1,528,924 | 111,871 | 121,871 | -940,873 | -77,190 | 1,782,886 |
| 2050 | 704,906 | 587,522 | 63,577 | 19,216 | -1,430,758 | -77,175 | -132,713 |
| 2051 | 567,160 | 164,041 | 109,977 | 19,218 | -2,411,967 | -71,447 | -1,623,019 |
| 2052 | 480,958 | 111,528 | 66,775 | 18,007 | -2,776,754 | -63,069 | -2,162,556 |
| 2053 | 756,460 | 875,129 | 189,903 | 127,393 | -1,105,182 | -69,591 | 774,112 |
| 2054 | 629,422 | 786,754 | 203,667 | 42,236 | -1,466,597 | -76,937 | 118,546 |
| 2055 | 697,412 | 727,363 | 297,238 | 52,738 | -1,163,909 | -81,081 | 529,760 |
| 2056 | 955,260 | 1,151,202 | 186,248 | 169,221 | -887,932 | -83,323 | 1,490,676 |
| 2057 | 663,489 | 539,499 | 104,143 | 33,376 | -1,272,005 | -81,579 | -13,077 |
| 2058 | 543,714 | 379,550 | 107,428 | 26,454 | -1,432,264 | -76,504 | -451,623 |
| 2059 | 516,904 | 190,829 | 65,982 | 25,586 | -1,924,204 | -71,122 | -1,196,025 |
| 2060 | 461,832 | 186,285 | 75,033 | 19,353 | -1,923,734 | -66,838 | -1,248,069 |
| 2061 | 483,873 | 254,002 | 125,183 | 34,990 | -1,662,322 | -65,509 | -829,782 |
| 2062 | 535,495 | 311,722 | 81,199 | 28,658 | -1,968,451 | -64,883 | -1,076,261 |
| 2063 | 747,374 | 894,377 | 185,862 | 103,344 | -1,173,248 | -65,287 | 692,423 |
| 2064 | 797,596 | 971,656 | 227,478 | 42,092 | -1,131,322 | -72,135 | 835,365 |
| 2065 | 518,644 | 334,263 | 69,814 | 18,276 | -2,046,917 | -70,907 | -1,176,825 |
| 2066 | 472,700 | 154,936 | 79,262 | 36,483 | -2,350,004 | -63,321 | -1,669,944 |
| 2067 | 550,095 | 255,426 | 74,266 | 22,151 | -2,087,215 | -64,426 | -1,249,703 |
| 2068 | 654,126 | 496,227 | 142,653 | 60,396 | -1,488,744 | -65,173 | -200,515 |
| 2069 | 1,067,944 | 1,528,924 | 112,385 | 123,705 | -984,856 | -76,302 | 1,771,799 |
| 2070 | 719,324 | 587,522 | 63,930 | 19,394 | -1,475,294 | -76,404 | -161,529 |

## Table 20 - Projected Future Groundwater Budget for Kern County Subbasin under Baseline Conditions WITH SGMA Projects based on C2VSimFG-Kern Simulation

| Water Year | Deep Percolation | Managed Recharge and Canal Seepage | Net GW/SW Interactions | Small Watershed Inflow | GW Pumping | Subsurface Flow with Adjacent GW Basins | Change in Groundwater Storage |
|---|---|---|---|---|---|---|---|
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| **SUMMARY: WY2021 to WY2070 Simulatation Period** | | | | | | | |
| **Total** | 33,771,527 | 32,630,931 | 5,233,643 | 2,457,805 | -69,157,708 | -5,025,601 | **-89,422** |
| **Average** | 675,431 | 652,619 | 104,673 | 49,156 | -1,383,154 | -100,512 | **-1,788** |
| **SUMMARY: WY2021 to WY2040 Implementation Period** | | | | | | | |
| **Total** | 13,100,548 | 12,612,730 | 2,239,160 | 948,239 | -28,535,055 | -1,719,340 | **-1,353,732** |
| **Average** | 655,027 | 630,637 | 111,958 | 47,412 | -1,426,753 | -85,967 | **-67,687** |
| **SUMMARY: WY2041 to WY2070 Sustainability Period** | | | | | | | |
| **Total** | 20,670,979 | 20,018,200 | 2,994,483 | 1,509,566 | -40,622,653 | -3,306,261 | **1,264,311** |
| **Average** | 689,033 | 667,273 | 99,816 | 50,319 | -1,354,088 | -110,209 | **42,144** |
| **Annual Simulation Results for WY2021 to WY2070 Simulation Period** | | | | | | | |
| 2021 | 430,153 | 302,373 | 123,650 | 38,770 | -1,594,606 | -83,189 | -782,849 |
| 2022 | 475,303 | 349,553 | 80,614 | 28,596 | -1,862,120 | -78,565 | -1,006,617 |
| 2023 | 770,374 | 1,002,929 | 168,647 | 97,803 | -1,009,264 | -78,404 | 952,085 |
| 2024 | 855,058 | 1,086,448 | 198,849 | 67,141 | -944,665 | -84,319 | 1,178,512 |
| 2025 | 503,643 | 350,298 | 70,663 | 18,060 | -1,861,303 | -81,925 | -1,000,565 |
| 2026 | 440,243 | 214,542 | 77,894 | 36,473 | -2,187,564 | -73,190 | -1,491,603 |
| 2027 | 518,989 | 316,584 | 73,092 | 21,942 | -1,919,158 | -73,183 | -1,061,733 |
| 2028 | 578,749 | 623,230 | 137,529 | 35,496 | -1,407,567 | -75,335 | -107,901 |
| 2029 | 1,194,895 | 1,696,947 | 83,255 | 119,558 | -744,743 | -87,273 | 2,262,638 |
| 2030 | 750,668 | 608,048 | 58,365 | 19,157 | -1,257,759 | -87,531 | 90,947 |
| 2031 | 555,404 | 180,833 | 107,613 | 19,161 | -2,187,295 | -83,584 | -1,407,869 |
| 2032 | 453,293 | 125,476 | 66,634 | 18,134 | -2,567,449 | -76,460 | -1,980,378 |
| 2033 | 824,902 | 1,059,059 | 172,274 | 126,420 | -840,738 | -84,135 | 1,257,782 |
| 2034 | 653,828 | 917,135 | 178,991 | 42,156 | -1,197,621 | -93,181 | 501,309 |
| 2035 | 827,370 | 931,556 | 238,868 | 52,652 | -872,560 | -98,679 | 1,079,205 |
| 2036 | 1,116,969 | 1,381,739 | 113,563 | 103,683 | -633,072 | -102,650 | 1,980,231 |
| 2037 | 725,584 | 594,384 | 63,749 | 32,114 | -1,023,020 | -100,141 | 292,669 |
| 2038 | 511,919 | 433,966 | 84,887 | 26,241 | -1,154,051 | -95,834 | -192,873 |
| 2039 | 489,540 | 224,450 | 65,153 | 25,370 | -1,627,860 | -92,035 | -915,382 |
| 2040 | 423,665 | 213,184 | 74,871 | 19,311 | -1,642,642 | -89,729 | -1,001,340 |
| 2041 | 445,485 | 305,376 | 122,807 | 34,980 | -1,354,885 | -89,185 | -535,423 |
| 2042 | 498,858 | 354,364 | 80,832 | 28,467 | -1,639,112 | -89,772 | -766,363 |
| 2043 | 812,155 | 1,090,304 | 140,266 | 100,835 | -882,848 | -92,437 | 1,168,274 |
| 2044 | 892,628 | 1,153,766 | 138,151 | 68,630 | -836,920 | -100,949 | 1,315,306 |
| 2045 | 524,833 | 355,672 | 49,525 | 18,136 | -1,730,147 | -100,070 | -882,051 |
| 2046 | 454,216 | 218,616 | 78,021 | 36,599 | -2,055,875 | -92,126 | -1,360,549 |
| 2047 | 532,454 | 320,562 | 73,425 | 22,117 | -1,809,154 | -93,438 | -954,033 |
| 2048 | 593,653 | 668,774 | 137,874 | 35,645 | -1,324,186 | -97,255 | 14,505 |
| 2049 | 1,234,198 | 1,750,812 | 79,492 | 121,871 | -710,054 | -110,080 | 2,366,239 |
| 2050 | 768,780 | 619,092 | 54,500 | 19,216 | -1,197,582 | -110,438 | 153,567 |
| 2051 | 578,825 | 192,400 | 107,098 | 19,218 | -2,110,155 | -106,461 | -1,319,074 |
| 2052 | 479,637 | 135,929 | 66,695 | 18,007 | -2,470,952 | -99,536 | -1,870,221 |
| 2053 | 850,038 | 1,095,469 | 170,484 | 127,393 | -813,603 | -107,867 | 1,321,915 |
| 2054 | 682,383 | 948,274 | 168,655 | 42,236 | -1,143,633 | -117,748 | 580,168 |
| 2055 | 858,469 | 966,141 | 223,989 | 52,738 | -849,900 | -123,451 | 1,127,986 |
| 2056 | 1,291,577 | 1,415,721 | 105,108 | 169,221 | -638,704 | -126,824 | 2,216,098 |
| 2057 | 807,949 | 600,599 | 52,465 | 33,376 | -1,027,113 | -123,865 | 343,411 |
| 2058 | 541,774 | 439,164 | 78,391 | 26,454 | -1,146,168 | -119,115 | -179,499 |
| 2059 | 503,264 | 229,194 | 64,724 | 25,586 | -1,627,673 | -114,273 | -919,179 |
| 2060 | 435,869 | 217,320 | 75,042 | 19,353 | -1,597,610 | -111,590 | -961,617 |
| 2061 | 449,783 | 308,906 | 122,761 | 34,990 | -1,363,117 | -110,530 | -557,207 |
| 2062 | 501,922 | 357,723 | 80,757 | 28,658 | -1,643,414 | -110,538 | -784,892 |
| 2063 | 820,754 | 1,111,099 | 135,039 | 103,344 | -898,437 | -113,406 | 1,158,393 |
| 2064 | 871,279 | 1,174,447 | 124,818 | 42,092 | -868,913 | -122,551 | 1,221,172 |
| 2065 | 511,277 | 358,753 | 43,942 | 18,276 | -1,750,481 | -120,972 | -939,204 |
| 2066 | 454,845 | 222,078 | 77,969 | 36,483 | -2,077,330 | -112,479 | -1,398,433 |
| 2067 | 531,138 | 323,961 | 73,264 | 22,151 | -1,832,363 | -113,339 | -995,189 |
| 2068 | 672,372 | 689,792 | 138,150 | 60,396 | -1,265,870 | -116,258 | 178,583 |
| 2069 | 1,286,647 | 1,771,462 | 77,455 | 123,705 | -733,283 | -129,909 | 2,396,076 |
| 2070 | 783,917 | 622,428 | 52,784 | 19,394 | -1,223,170 | -129,799 | 125,553 |

## Table 21 - Projected Future Groundwater Budget for Kern County Subbasin under 2030 Climate Conditions with NO SGMA Projects based on C2VSimFG-Kern Simulation

| Water Year | Deep Percolation | Managed Recharge and Canal Seepage | Net GW/SW Interactions | Small Watershed Inflow | GW Pumping | Subsurface Flow with Adjacent GW Basins | Change in Groundwater Storage |
|---|---|---|---|---|---|---|---|
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| **SUMMARY: WY2021 to WY2070 Simulatation Period** | | | | | | | |
| **Total** | 30,885,159 | 30,404,998 | 6,083,382 | 2,517,393 | -85,792,996 | -3,318,618 | **-19,220,714** |
| **Average** | 617,703 | 608,100 | 121,668 | 50,348 | -1,715,860 | -66,372 | **-384,414** |
| **SUMMARY: WY2021 to WY2040 Implementation Period** | | | | | | | |
| **Total** | 11,956,360 | 12,006,382 | 2,488,942 | 967,011 | -33,772,959 | -1,439,420 | **-7,793,706** |
| **Average** | 597,818 | 600,319 | 124,447 | 48,351 | -1,688,648 | -71,971 | **-389,685** |
| **SUMMARY: WY2041 to WY2070 Sustainability Period** | | | | | | | |
| **Total** | 18,928,799 | 18,398,617 | 3,594,440 | 1,550,382 | -52,020,037 | -1,879,198 | **-11,427,008** |
| **Average** | 630,960 | 613,287 | 119,815 | 51,679 | -1,734,001 | -62,640 | **-380,900** |
| **Annual Simulation Results for WY2021 to WY2070 Simulation Period** | | | | | | | |
| 2021 | 422,205 | 264,773 | 147,393 | 42,134 | -1,686,375 | -82,161 | -892,031 |
| 2022 | 486,382 | 352,708 | 97,994 | 31,229 | -1,966,104 | -77,718 | -1,075,519 |
| 2023 | 670,731 | 968,807 | 192,300 | 100,122 | -1,194,263 | -75,163 | 662,531 |
| 2024 | 724,438 | 1,015,022 | 177,313 | 64,551 | -1,153,552 | -78,823 | 748,944 |
| 2025 | 451,579 | 327,176 | 67,822 | 18,068 | -2,002,002 | -75,206 | -1,212,569 |
| 2026 | 443,127 | 213,524 | 132,483 | 37,800 | -2,325,127 | -67,041 | -1,565,234 |
| 2027 | 508,495 | 246,268 | 115,977 | 23,732 | -2,151,549 | -65,434 | -1,322,507 |
| 2028 | 572,490 | 566,005 | 191,408 | 39,445 | -1,651,430 | -65,956 | -348,038 |
| 2029 | 1,218,648 | 1,901,727 | 112,842 | 122,295 | -1,104,305 | -76,600 | 2,174,607 |
| 2030 | 553,673 | 532,639 | 51,185 | 19,641 | -1,476,524 | -74,857 | -394,243 |
| 2031 | 521,194 | 199,452 | 76,829 | 18,143 | -2,339,207 | -68,717 | -1,592,305 |
| 2032 | 453,699 | 143,631 | 46,557 | 17,968 | -2,788,464 | -60,558 | -2,187,167 |
| 2033 | 743,629 | 915,198 | 182,822 | 122,210 | -1,190,116 | -67,058 | 706,686 |
| 2034 | 615,276 | 872,000 | 147,377 | 45,764 | -1,543,359 | -73,439 | 63,619 |
| 2035 | 736,533 | 843,258 | 281,587 | 55,297 | -1,297,450 | -77,197 | 542,029 |
| 2036 | 863,933 | 1,264,065 | 123,884 | 102,926 | -1,044,324 | -79,069 | 1,231,416 |
| 2037 | 542,139 | 510,531 | 72,919 | 32,384 | -1,342,279 | -75,848 | -260,154 |
| 2038 | 507,189 | 428,732 | 81,591 | 27,413 | -1,503,202 | -70,781 | -529,059 |
| 2039 | 482,914 | 213,280 | 87,387 | 26,084 | -2,017,703 | -65,709 | -1,273,748 |
| 2040 | 438,087 | 227,586 | 101,273 | 19,804 | -1,995,626 | -62,086 | -1,270,964 |
| 2041 | 462,417 | 263,946 | 147,623 | 39,151 | -1,702,404 | -60,765 | -850,032 |
| 2042 | 532,326 | 354,460 | 98,221 | 31,228 | -2,012,621 | -59,960 | -1,056,345 |
| 2043 | 717,292 | 967,381 | 179,212 | 103,193 | -1,243,088 | -59,869 | 664,119 |
| 2044 | 766,402 | 1,015,346 | 117,742 | 65,724 | -1,204,632 | -65,643 | 694,939 |
| 2045 | 477,463 | 326,770 | 51,863 | 18,138 | -2,051,621 | -63,896 | -1,241,282 |
| 2046 | 465,642 | 213,337 | 132,843 | 37,870 | -2,374,509 | -57,074 | -1,581,891 |
| 2047 | 526,192 | 246,482 | 116,132 | 23,946 | -2,201,023 | -56,606 | -1,344,877 |
| 2048 | 584,963 | 564,936 | 191,656 | 39,636 | -1,700,745 | -57,895 | -377,449 |
| 2049 | 1,218,687 | 1,904,385 | 99,805 | 124,949 | -1,152,654 | -69,447 | 2,125,726 |
| 2050 | 560,761 | 533,577 | 47,140 | 19,693 | -1,524,426 | -68,362 | -431,617 |
| 2051 | 531,733 | 199,452 | 76,920 | 18,193 | -2,385,216 | -62,565 | -1,621,483 |
| 2052 | 469,853 | 139,904 | 46,651 | 17,931 | -2,807,543 | -54,827 | -2,188,030 |
| 2053 | 748,982 | 916,702 | 183,503 | 123,682 | -1,235,658 | -61,582 | 675,628 |
| 2054 | 618,472 | 870,588 | 145,806 | 45,880 | -1,587,472 | -68,329 | 24,946 |
| 2055 | 736,517 | 843,485 | 279,382 | 55,392 | -1,341,090 | -72,519 | 501,167 |
| 2056 | 954,438 | 1,263,249 | 134,078 | 169,164 | -1,037,331 | -74,710 | 1,408,888 |
| 2057 | 579,927 | 508,121 | 73,014 | 33,640 | -1,384,414 | -71,487 | -261,199 |
| 2058 | 532,403 | 431,547 | 81,726 | 27,628 | -1,544,662 | -66,368 | -537,727 |
| 2059 | 503,820 | 214,669 | 87,386 | 26,299 | -2,057,978 | -61,126 | -1,286,930 |
| 2060 | 456,299 | 228,154 | 101,178 | 19,792 | -1,984,645 | -57,872 | -1,237,094 |
| 2061 | 478,968 | 264,126 | 147,695 | 39,158 | -1,742,970 | -56,708 | -869,739 |
| 2062 | 546,856 | 353,554 | 98,263 | 31,426 | -2,052,889 | -55,984 | -1,078,775 |
| 2063 | 740,448 | 969,075 | 181,599 | 104,939 | -1,284,313 | -56,141 | 655,606 |
| 2064 | 735,683 | 1,013,851 | 124,774 | 41,649 | -1,277,235 | -62,203 | 576,518 |
| 2065 | 478,349 | 327,088 | 54,630 | 18,289 | -2,092,701 | -60,730 | -1,275,076 |
| 2066 | 473,836 | 213,074 | 132,845 | 37,782 | -2,406,519 | -57,164 | -1,606,144 |
| 2067 | 537,374 | 246,454 | 116,277 | 23,923 | -2,231,035 | -58,641 | -1,365,648 |
| 2068 | 660,267 | 565,258 | 192,661 | 65,542 | -1,647,974 | -59,014 | -223,263 |
| 2069 | 1,254,195 | 1,903,367 | 104,892 | 126,664 | -1,191,285 | -71,013 | 2,126,821 |
| 2070 | 578,235 | 536,275 | 48,924 | 19,883 | -1,559,383 | -70,699 | -446,765 |

## Table 22 - Projected Future Groundwater Budget for Kern County Subbasin under 2030 Climate Conditions WITH SGMA Projects based on C2VSimFG-Kern Simulation

| Water Year | Deep Percolation | Managed Recharge and Canal Seepage | Net GW/SW Interactions | Small Watershed Inflow | GW Pumping | Subsurface Flow with Adjacent GW Basins | Change in Groundwater Storage |
|---|---|---|---|---|---|---|---|
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| **SUMMARY: WY2021 to WY2070 Simulatation Period** | | | | | | | |
| **Total** | 32,838,979 | 35,447,299 | 4,941,607 | 2,517,393 | -73,869,518 | -4,735,936 | **-2,860,202** |
| **Average** | 656,780 | 708,946 | 98,832 | 50,348 | -1,477,390 | -94,719 | **-57,204** |
| **SUMMARY: WY2021 to WY2040 Implementation Period** | | | | | | | |
| **Total** | 12,873,160 | 13,719,306 | 2,153,021 | 967,011 | -30,545,188 | -1,641,666 | **-2,474,378** |
| **Average** | 643,658 | 685,965 | 107,651 | 48,351 | -1,527,259 | -82,083 | **-123,719** |
| **SUMMARY: WY2041 to WY2070 Sustainability Period** | | | | | | | |
| **Total** | 19,965,818 | 21,727,994 | 2,788,586 | 1,550,382 | -43,324,331 | -3,094,271 | **-385,823** |
| **Average** | 665,527 | 724,266 | 92,953 | 51,679 | -1,444,144 | -103,142 | **-12,861** |
| **Annual Simulation Results for WY2021 to WY2070 Simulation Period** | | | | | | | |
| 2021 | 436,607 | 313,191 | 146,335 | 42,134 | -1,676,044 | -81,420 | -819,196 |
| 2022 | 495,680 | 391,450 | 97,863 | 31,229 | -1,947,388 | -76,701 | -1,007,874 |
| 2023 | 777,040 | 1,077,709 | 179,601 | 100,122 | -1,117,722 | -76,444 | 940,302 |
| 2024 | 808,215 | 1,130,101 | 141,980 | 64,551 | -1,088,738 | -81,861 | 974,238 |
| 2025 | 462,701 | 343,315 | 61,517 | 18,068 | -1,906,220 | -78,953 | -1,099,574 |
| 2026 | 439,400 | 273,084 | 131,767 | 37,800 | -2,253,887 | -70,713 | -1,442,550 |
| 2027 | 504,308 | 306,757 | 115,891 | 23,732 | -2,068,551 | -69,760 | -1,187,619 |
| 2028 | 576,402 | 692,833 | 189,187 | 39,445 | -1,565,005 | -71,313 | -138,447 |
| 2029 | 1,371,389 | 2,070,178 | 67,647 | 122,295 | -932,879 | -84,094 | 2,614,536 |
| 2030 | 584,511 | 553,212 | 37,888 | 19,641 | -1,345,295 | -83,321 | -233,371 |
| 2031 | 528,715 | 216,234 | 76,879 | 18,143 | -2,159,236 | -78,674 | -1,397,939 |
| 2032 | 447,278 | 157,578 | 46,694 | 17,968 | -2,586,970 | -72,132 | -1,989,585 |
| 2033 | 822,633 | 1,099,092 | 179,078 | 122,210 | -954,120 | -79,949 | 1,188,943 |
| 2034 | 642,235 | 1,002,883 | 120,224 | 45,764 | -1,314,339 | -88,379 | 408,386 |
| 2035 | 882,067 | 1,046,864 | 225,239 | 55,297 | -1,036,291 | -94,244 | 1,078,932 |
| 2036 | 1,079,981 | 1,496,375 | 67,732 | 102,926 | -748,234 | -98,400 | 1,900,379 |
| 2037 | 618,298 | 565,459 | 31,639 | 32,384 | -1,137,009 | -94,427 | 16,344 |
| 2038 | 503,029 | 481,733 | 53,082 | 27,413 | -1,262,856 | -89,986 | -287,584 |
| 2039 | 473,864 | 246,867 | 81,296 | 26,084 | -1,751,020 | -86,330 | -1,009,239 |
| 2040 | 418,807 | 254,393 | 101,481 | 19,804 | -1,693,383 | -84,564 | -983,462 |
| 2041 | 444,811 | 315,197 | 147,563 | 39,151 | -1,429,438 | -83,810 | -566,526 |
| 2042 | 514,255 | 397,576 | 97,317 | 31,228 | -1,723,016 | -83,907 | -766,546 |
| 2043 | 816,698 | 1,163,940 | 134,478 | 103,193 | -969,015 | -86,356 | 1,162,938 |
| 2044 | 847,571 | 1,197,675 | 50,668 | 65,724 | -949,162 | -94,611 | 1,117,864 |
| 2045 | 471,125 | 348,281 | 32,446 | 18,138 | -1,769,470 | -93,309 | -992,789 |
| 2046 | 446,314 | 276,979 | 132,424 | 37,870 | -2,116,321 | -86,037 | -1,308,771 |
| 2047 | 507,943 | 310,952 | 116,190 | 23,946 | -1,951,408 | -86,246 | -1,078,625 |
| 2048 | 570,746 | 737,315 | 190,434 | 39,636 | -1,454,664 | -89,846 | -6,380 |
| 2049 | 1,365,299 | 2,126,760 | 34,358 | 124,949 | -846,645 | -103,976 | 2,700,745 |
| 2050 | 579,883 | 565,192 | 23,802 | 19,693 | -1,287,166 | -103,007 | -201,604 |
| 2051 | 538,250 | 227,799 | 76,822 | 18,193 | -2,083,539 | -98,472 | -1,320,948 |
| 2052 | 464,011 | 164,305 | 46,977 | 17,931 | -2,493,990 | -92,183 | -1,892,949 |
| 2053 | 839,476 | 1,136,728 | 177,834 | 123,682 | -921,588 | -100,638 | 1,255,494 |
| 2054 | 659,537 | 1,032,674 | 98,253 | 45,880 | -1,258,249 | -110,065 | 468,030 |
| 2055 | 903,882 | 1,081,677 | 208,421 | 55,392 | -1,002,340 | -116,311 | 1,130,721 |
| 2056 | 1,216,310 | 1,529,332 | 56,914 | 169,164 | -718,274 | -120,237 | 2,133,209 |
| 2057 | 673,501 | 569,268 | 16,245 | 33,640 | -1,122,622 | -115,686 | 54,346 |
| 2058 | 522,020 | 489,739 | 44,186 | 27,628 | -1,253,276 | -110,474 | -280,179 |
| 2059 | 481,112 | 252,996 | 77,161 | 26,299 | -1,749,204 | -105,946 | -1,017,581 |
| 2060 | 429,670 | 259,054 | 101,488 | 19,792 | -1,652,713 | -103,828 | -946,537 |
| 2061 | 447,419 | 318,905 | 147,790 | 39,158 | -1,437,034 | -102,731 | -586,494 |
| 2062 | 515,397 | 400,090 | 96,110 | 31,426 | -1,726,653 | -102,439 | -786,068 |
| 2063 | 822,203 | 1,186,122 | 125,545 | 104,939 | -982,407 | -105,263 | 1,151,138 |
| 2064 | 812,383 | 1,217,000 | 39,194 | 41,649 | -986,296 | -114,017 | 1,009,913 |
| 2065 | 461,447 | 351,690 | 27,964 | 18,289 | -1,789,318 | -112,105 | -1,042,033 |
| 2066 | 449,867 | 280,211 | 132,607 | 37,782 | -2,125,316 | -106,826 | -1,331,675 |
| 2067 | 511,035 | 314,307 | 116,486 | 23,923 | -1,960,796 | -107,878 | -1,102,923 |
| 2068 | 651,081 | 758,626 | 191,836 | 65,542 | -1,393,447 | -109,878 | 163,759 |
| 2069 | 1,417,188 | 2,146,388 | 28,009 | 126,664 | -861,456 | -124,760 | 2,732,032 |
| 2070 | 585,382 | 571,217 | 19,064 | 19,883 | -1,309,505 | -123,427 | -237,386 |

## Table 23 - Projected Future Groundwater Budget for Kern County Subbasin under 2070 Climate Conditions with NO SGMA Projects based on C2VSimFG-Kern Simulation

| Water Year | Deep Percolation | Managed Recharge and Canal Seepage | Net GW/SW Interactions | Small Watershed Inflow | GW Pumping | Subsurface Flow with Adjacent GW Basins | Change in Groundwater Storage |
|---|---|---|---|---|---|---|---|
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| **SUMMARY: WY2021 to WY2070 Simulatation Period** | | | | | | | |
| **Total** | 30,266,907 | 32,824,218 | 5,541,096 | 2,495,122 | -92,372,522 | -3,271,463 | **-24,516,680** |
| **Average** | 605,338 | 656,484 | 110,822 | 49,902 | -1,847,450 | -65,429 | **-490,334** |
| **SUMMARY: WY2021 to WY2040 Implementation Period** | | | | | | | |
| **Total** | 11,792,918 | 12,994,527 | 2,263,192 | 960,586 | -36,385,358 | -1,447,672 | **-9,821,843** |
| **Average** | 589,646 | 649,726 | 113,160 | 48,029 | -1,819,268 | -72,384 | **-491,092** |
| **SUMMARY: WY2041 to WY2070 Sustainability Period** | | | | | | | |
| **Total** | 18,473,988 | 19,829,691 | 3,277,904 | 1,534,536 | -55,987,164 | -1,823,791 | **-14,694,837** |
| **Average** | 615,800 | 660,990 | 109,263 | 51,151 | -1,866,239 | -60,793 | **-489,828** |
| **Annual Simulation Results for WY2021 to WY2070 Simulation Period** | | | | | | | |
| 2021 | 408,652 | 250,550 | 140,163 | 38,275 | -1,842,475 | -83,663 | -1,088,499 |
| 2022 | 472,102 | 369,832 | 95,673 | 30,903 | -2,096,387 | -78,608 | -1,206,496 |
| 2023 | 673,989 | 1,058,910 | 189,890 | 97,206 | -1,367,109 | -76,560 | 576,325 |
| 2024 | 744,177 | 1,122,749 | 154,523 | 64,640 | -1,269,966 | -81,123 | 734,995 |
| 2025 | 434,940 | 339,216 | 62,383 | 18,095 | -2,093,637 | -77,242 | -1,316,253 |
| 2026 | 469,752 | 316,670 | 142,130 | 42,165 | -2,392,400 | -68,542 | -1,490,227 |
| 2027 | 468,805 | 219,342 | 111,136 | 22,713 | -2,302,101 | -66,245 | -1,546,351 |
| 2028 | 565,266 | 622,490 | 194,932 | 37,491 | -1,777,664 | -66,172 | -423,661 |
| 2029 | 1,232,895 | 2,021,954 | 94,628 | 120,391 | -1,272,882 | -75,969 | 2,121,016 |
| 2030 | 512,383 | 510,545 | 46,067 | 18,406 | -1,606,048 | -73,952 | -592,602 |
| 2031 | 514,885 | 217,243 | 80,080 | 18,510 | -2,404,879 | -69,108 | -1,643,271 |
| 2032 | 420,919 | 109,243 | 41,157 | 17,864 | -2,961,316 | -59,737 | -2,431,871 |
| 2033 | 717,704 | 983,283 | 185,465 | 124,666 | -1,366,638 | -66,770 | 577,711 |
| 2034 | 636,472 | 1,011,310 | 124,135 | 48,403 | -1,629,020 | -73,691 | 117,609 |
| 2035 | 742,442 | 926,830 | 240,059 | 52,829 | -1,506,120 | -76,785 | 379,255 |
| 2036 | 840,589 | 1,369,821 | 66,325 | 95,355 | -1,236,377 | -78,889 | 1,056,824 |
| 2037 | 511,349 | 550,855 | 51,377 | 33,462 | -1,460,435 | -75,693 | -389,084 |
| 2038 | 525,422 | 516,749 | 68,512 | 30,839 | -1,615,455 | -70,944 | -544,878 |
| 2039 | 486,185 | 261,453 | 84,925 | 29,526 | -2,078,540 | -66,064 | -1,282,515 |
| 2040 | 413,990 | 215,482 | 89,632 | 18,846 | -2,105,907 | -61,915 | -1,429,871 |
| 2041 | 434,872 | 249,759 | 141,456 | 34,801 | -1,861,023 | -59,685 | -1,059,819 |
| 2042 | 506,082 | 371,490 | 95,431 | 30,811 | -2,143,228 | -58,424 | -1,197,837 |
| 2043 | 701,042 | 1,057,536 | 164,332 | 99,819 | -1,415,545 | -58,898 | 548,287 |
| 2044 | 765,882 | 1,123,035 | 84,872 | 65,709 | -1,321,033 | -65,596 | 652,868 |
| 2045 | 457,199 | 338,796 | 43,022 | 18,140 | -2,143,265 | -63,760 | -1,349,868 |
| 2046 | 491,322 | 316,422 | 142,576 | 42,210 | -2,441,728 | -56,475 | -1,505,673 |
| 2047 | 486,516 | 219,663 | 111,300 | 22,758 | -2,350,989 | -55,383 | -1,566,136 |
| 2048 | 575,922 | 621,390 | 195,292 | 37,553 | -1,826,869 | -56,367 | -453,078 |
| 2049 | 1,207,108 | 2,024,646 | 76,576 | 122,702 | -1,321,171 | -67,189 | 2,042,673 |
| 2050 | 516,604 | 511,479 | 41,647 | 18,437 | -1,653,603 | -66,049 | -631,485 |
| 2051 | 524,249 | 217,243 | 80,184 | 18,541 | -2,450,881 | -61,709 | -1,672,374 |
| 2052 | 436,390 | 105,521 | 41,256 | 17,846 | -2,980,914 | -52,973 | -2,432,875 |
| 2053 | 721,385 | 984,833 | 185,983 | 125,947 | -1,412,037 | -60,560 | 545,551 |
| 2054 | 637,035 | 1,010,015 | 122,314 | 48,546 | -1,673,215 | -67,888 | 76,808 |
| 2055 | 739,029 | 926,775 | 240,837 | 53,236 | -1,549,608 | -71,550 | 338,718 |
| 2056 | 916,865 | 1,369,239 | 78,789 | 163,750 | -1,223,884 | -73,970 | 1,230,789 |
| 2057 | 542,683 | 548,446 | 53,332 | 34,610 | -1,503,509 | -70,686 | -395,124 |
| 2058 | 550,193 | 519,512 | 70,081 | 31,051 | -1,656,729 | -65,944 | -551,837 |
| 2059 | 506,313 | 262,783 | 85,481 | 29,722 | -2,118,584 | -60,956 | -1,295,243 |
| 2060 | 434,143 | 216,084 | 89,721 | 18,987 | -2,098,596 | -57,233 | -1,396,893 |
| 2061 | 453,048 | 249,994 | 141,478 | 34,761 | -1,901,319 | -55,229 | -1,077,267 |
| 2062 | 522,814 | 370,621 | 95,685 | 30,984 | -2,183,537 | -54,157 | -1,217,590 |
| 2063 | 725,002 | 1,059,135 | 169,499 | 100,139 | -1,456,460 | -54,936 | 542,379 |
| 2064 | 737,845 | 1,121,596 | 96,738 | 41,720 | -1,390,161 | -62,039 | 545,700 |
| 2065 | 456,525 | 339,078 | 47,370 | 18,277 | -2,183,880 | -60,597 | -1,383,226 |
| 2066 | 498,361 | 316,005 | 142,585 | 41,907 | -2,483,011 | -53,520 | -1,537,673 |
| 2067 | 496,804 | 219,419 | 111,431 | 22,808 | -2,393,461 | -52,693 | -1,595,690 |
| 2068 | 655,939 | 621,712 | 196,418 | 66,128 | -1,787,044 | -52,309 | -299,157 |
| 2069 | 1,243,827 | 2,023,476 | 87,110 | 124,017 | -1,364,360 | -64,030 | 2,050,039 |
| 2070 | 532,988 | 513,990 | 45,107 | 18,619 | -1,697,522 | -62,987 | -649,805 |

## Table 24 - Projected Future Groundwater Budget for Kern County Subbasin under 2070 Climate Conditions WITH SGMA Projects based on C2VSimFG-Kern Simulation

| Water Year | Deep Percolation | Managed Recharge and Canal Seepage | Net GW/SW Interactions | Small Watershed Inflow | GW Pumping | Subsurface Flow with Adjacent GW Basins | Change in Groundwater Storage |
|---|---|---|---|---|---|---|---|
| Units | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft | Acre-ft |
| **SUMMARY: WY2021 to WY2070 Simulatation Period** | | | | | | | |
| **Total** | 31,799,129 | 37,863,262 | 4,293,932 | 2,495,122 | -79,755,674 | -4,729,641 | **-8,033,910** |
| **Average** | 635,983 | 757,265 | 85,879 | 49,902 | -1,595,113 | -94,593 | **-160,678** |
| **SUMMARY: WY2021 to WY2040 Implementation Period** | | | | | | | |
| **Total** | 12,589,633 | 14,705,737 | 1,891,043 | 960,586 | -32,975,395 | -1,657,287 | **-4,485,720** |
| **Average** | 629,482 | 735,287 | 94,552 | 48,029 | -1,648,770 | -82,864 | **-224,286** |
| **SUMMARY: WY2041 to WY2070 Sustainability Period** | | | | | | | |
| **Total** | 19,209,496 | 23,157,525 | 2,402,889 | 1,534,536 | -46,780,279 | -3,072,354 | **-3,548,190** |
| **Average** | 640,317 | 771,917 | 80,096 | 51,151 | -1,559,343 | -102,412 | **-118,273** |
| **Annual Simulation Results for WY2021 to WY2070 Simulation Period** | | | | | | | |
| 2021 | 416,859 | 299,174 | 140,033 | 38,275 | -1,829,917 | -83,068 | -1,018,646 |
| 2022 | 482,771 | 408,716 | 95,545 | 30,903 | -2,075,055 | -77,724 | -1,134,857 |
| 2023 | 778,119 | 1,167,829 | 176,974 | 97,206 | -1,283,726 | -78,065 | 858,337 |
| 2024 | 824,224 | 1,237,834 | 116,452 | 64,640 | -1,201,267 | -84,296 | 957,582 |
| 2025 | 444,081 | 355,471 | 55,004 | 18,095 | -1,995,258 | -81,218 | -1,203,834 |
| 2026 | 466,475 | 376,346 | 141,087 | 42,165 | -2,313,156 | -72,774 | -1,359,861 |
| 2027 | 464,976 | 279,425 | 111,024 | 22,713 | -2,213,764 | -70,681 | -1,406,307 |
| 2028 | 569,538 | 749,332 | 192,740 | 37,491 | -1,685,558 | -71,949 | -208,410 |
| 2029 | 1,366,993 | 2,190,420 | 41,284 | 120,391 | -1,077,423 | -84,620 | 2,557,045 |
| 2030 | 534,178 | 531,150 | 29,555 | 18,406 | -1,464,690 | -82,917 | -434,320 |
| 2031 | 519,704 | 234,003 | 79,675 | 18,510 | -2,224,205 | -79,250 | -1,451,562 |
| 2032 | 415,122 | 123,188 | 41,020 | 17,864 | -2,750,519 | -71,829 | -2,225,156 |
| 2033 | 783,412 | 1,166,531 | 179,799 | 124,666 | -1,109,329 | -80,416 | 1,064,663 |
| 2034 | 658,731 | 1,142,196 | 88,031 | 48,403 | -1,395,221 | -89,128 | 453,011 |
| 2035 | 863,103 | 1,130,070 | 184,994 | 52,829 | -1,232,204 | -94,328 | 904,464 |
| 2036 | 1,029,800 | 1,602,138 | 12,470 | 95,355 | -917,373 | -98,485 | 1,723,905 |
| 2037 | 570,198 | 605,678 | 8,505 | 33,462 | -1,243,785 | -94,402 | -120,345 |
| 2038 | 523,835 | 569,446 | 34,689 | 30,839 | -1,363,512 | -90,407 | -295,110 |
| 2039 | 479,164 | 294,676 | 72,792 | 29,526 | -1,805,973 | -86,949 | -1,016,764 |
| 2040 | 398,352 | 242,115 | 89,372 | 18,846 | -1,793,459 | -84,780 | -1,129,554 |
| 2041 | 414,818 | 301,192 | 141,646 | 34,801 | -1,568,913 | -83,592 | -760,049 |
| 2042 | 491,990 | 414,742 | 93,845 | 30,811 | -1,840,528 | -83,323 | -892,462 |
| 2043 | 790,613 | 1,254,107 | 115,429 | 99,819 | -1,116,588 | -86,323 | 1,057,057 |
| 2044 | 836,403 | 1,305,369 | 17,905 | 65,709 | -1,045,824 | -95,401 | 1,084,162 |
| 2045 | 449,154 | 360,429 | 22,817 | 18,140 | -1,852,116 | -93,998 | -1,095,574 |
| 2046 | 471,989 | 380,169 | 142,402 | 42,210 | -2,176,184 | -86,568 | -1,225,983 |
| 2047 | 471,984 | 283,737 | 111,550 | 22,758 | -2,085,163 | -85,737 | -1,280,870 |
| 2048 | 554,428 | 793,776 | 194,145 | 37,553 | -1,568,985 | -88,857 | -77,939 |
| 2049 | 1,321,092 | 2,246,987 | 3,572 | 122,702 | -987,606 | -102,881 | 2,603,867 |
| 2050 | 524,857 | 543,145 | 12,030 | 18,437 | -1,398,511 | -101,367 | -401,409 |
| 2051 | 526,155 | 245,563 | 79,307 | 18,541 | -2,147,741 | -98,008 | -1,376,184 |
| 2052 | 430,658 | 129,919 | 41,236 | 17,846 | -2,649,533 | -91,211 | -2,121,085 |
| 2053 | 792,109 | 1,204,216 | 177,747 | 125,947 | -1,064,253 | -100,431 | 1,135,335 |
| 2054 | 668,348 | 1,172,104 | 66,220 | 48,546 | -1,336,993 | -110,282 | 507,943 |
| 2055 | 860,469 | 1,164,599 | 170,576 | 53,236 | -1,194,626 | -115,992 | 938,261 |
| 2056 | 1,144,616 | 1,635,346 | 2,390 | 163,750 | -873,811 | -120,178 | 1,952,112 |
| 2057 | 610,598 | 609,490 | -6,003 | 34,610 | -1,226,393 | -115,425 | -93,124 |
| 2058 | 546,965 | 577,365 | 26,400 | 31,051 | -1,353,145 | -110,712 | -282,076 |
| 2059 | 486,798 | 300,706 | 68,354 | 29,722 | -1,802,615 | -106,347 | -1,023,382 |
| 2060 | 409,456 | 246,809 | 89,277 | 18,987 | -1,751,495 | -103,792 | -1,090,757 |
| 2061 | 418,628 | 304,951 | 141,821 | 34,761 | -1,574,579 | -102,407 | -776,824 |
| 2062 | 495,173 | 417,295 | 92,534 | 30,984 | -1,842,095 | -101,824 | -907,934 |
| 2063 | 793,354 | 1,276,196 | 108,214 | 100,139 | -1,128,328 | -105,241 | 1,044,334 |
| 2064 | 805,281 | 1,324,749 | 9,903 | 41,720 | -1,082,528 | -114,909 | 984,217 |
| 2065 | 440,536 | 363,793 | 19,730 | 18,277 | -1,870,357 | -113,021 | -1,141,042 |
| 2066 | 471,618 | 383,251 | 141,837 | 41,907 | -2,193,139 | -104,993 | -1,259,519 |
| 2067 | 473,770 | 286,942 | 111,773 | 22,808 | -2,105,041 | -103,867 | -1,313,616 |
| 2068 | 625,100 | 815,113 | 195,615 | 66,128 | -1,516,065 | -105,894 | 79,999 |
| 2069 | 1,353,276 | 2,266,438 | 1,701 | 124,017 | -1,005,088 | -121,015 | 2,619,328 |
| 2070 | 529,258 | 549,028 | 8,916 | 18,619 | -1,422,036 | -118,758 | -434,973 |

## TABLE 25: Assessment of change in groundwater storage from C2VSimFG-Kern model results for historical and future scenarios for the Kern County Subbasin

| Scenario | Model Results 2041-2070 Sustainability Period | | Adjustments to GW Storage Change 2041-2070 Sustainability Period | | |
|---|---|---|---|---|---|
| | Change in Groundwater Storage | Change in Net Operational Budget | Adjustment for Excess Basin Outflows | Adjustment for Excess Kern River Outflow | Adjusted Change in GW Storage |
| **units** | **AFY** | **AFY** | AFY | AFY | **AFY** |
| Historic | **-274,200** | **-187,118** | 0 | 0 | **-274,200** |
| Current | **-344,019** | **-276,317** | 0 | 0 | **-344,019** |
| | | | | | |
| Baseline | **-324,326** | **-253,629** | 0 | 0 | **-324,326** |
| Base Projects | **42,144** | **152,353** | 26,327 | 17,108 | **85,578** |
| | | | | | |
| 2030 Climate | **-380,900** | **-318,260** | 0 | 8,780 | **-372,120** |
| 2030 Projects | **-12,861** | **90,282** | 27,056 | 32,634 | **46,829** |
| | | | | | |
| 2070 Climate | **-489,828** | **-429,035** | 0 | 17,492 | **-472,336** |
| 2070 Projects | **-118,273** | **-15,861** | 28,077 | 44,227 | **-45,969** |

NOTE:

**"Change in *Groundwater Storage* " DOES** include subsurface flow with adjacent basins

**"*Operational Storage* " DOES NOT** include subsurface flow with adjacent basins

**"Adjustment for *Excess Basin Outflows* "** is the difference in simulated basin outflow that is attributed to addition of SGMA projects in Kern County without comparable SGMA projects added to adjacent basins**.** Adjustment assumes that this difference is due to limitation of simulation, and that this difference would remain in Kern County when SGMA projects from adjacent basin are included in simulation.

**"Adjustment for *Excess Kern River Outflow* "** is the increase in simulated groundwater outflows to Kern River relative to Baseline condition that are attributed to SGMA Projects and Climate Change. Model is not optimized for river management. Since the Kern River is a highly managed system, the assumption is that in practice this water would be recovered for beneficial use rather than be a loss of water from the basin.

**"*Adjusted Change in GW Storage* "** Change in GW Storage plus modifications listed as adjustments to provide a more realistic Change in GW Storage estimate for the simulation.

## TABLE 26: Evaluation of Sustainable Yield for Projected-Future scenarios based on C2VSimFG-Kern Model Results for Kern County Subbasin

| Scenario | C2VSimFG-Kern Model Results 2041-2070 Sustainability Period | | | | | |
|---|---|---|---|---|---|---|
| | Groundwater Pumping | Change in Groundwater in Storage | GW Storage Adjustments | Sustainable Yield | Average Annual Difference of Pumping to Yield | Percent Difference of Pumping to Sustainable Yield |
| **units** | **AFY** | **AFY** | **AFY** | **AFY** | **AFY** | **AFY** |
| Historic | **1,586,417** | **-274,200** | **0** | **1,312,218** | **-274,200** | **-21%** |
| | | | | | | |
| Baseline | **1,624,694** | **-324,326** | **0** | **1,300,369** | **-324,326** | **-25%** |
| Baseline Projects | **1,354,088** | **42,144** | **43,434** | **1,439,666** | **85,578** | **6%** |
| | | | | | | |
| 2030 Climate | **1,734,001** | **-380,900** | **8,780** | **1,361,881** | **-372,120** | **-27%** |
| 2030 Projects | **1,444,144** | **-12,861** | **59,690** | **1,490,974** | **46,829** | **3%** |
| | | | | | | |
| 2070 Climate | **1,866,239** | **-489,828** | **17,492** | **1,393,902** | **-472,336** | **-34%** |
| 2070 Projects | **1,559,343** | **-118,273** | **72,304** | **1,513,373** | **-45,969** | **-3%** |

NOTES:

**Current period is not conisdered to be hydrologically balanced, so it is not included in the sustainable yield analysis**

| | |
|---|---|
| **Groundwater Pumping** | Total groundwater pumping by wells. Groundwater banking recovery pumping is specified input whereas agricultural and municipal pumping is calculated by C2VSim based on demand |
| **Change in Groundwater in Storage** | Sum of the inflow components (positive numbers) plus the outflow components (negative numbers): positive is an increase in storage typified by a rise in GW levels whereas a negative is a decrease in storage typified by a decline in GW levels |
| **Adjusted Banking** | Adjustment that assumes that recharge operations are affected by reductions in imported water sources, but |
| **GW Storage Adjustments** | Adjustment to GW Storage that reflect artifacts of the simulation. For Kern County, adjustments made to reflect no SGMA projects simulated north of Kern County, and that Kern River operations are not optimized to |
| **Sutainable Yield** | Sustainable yield is defined is the amount of pumping that can be sustained in the groundwater basin without the undesirable effect of a decline in groundwater storage that serves as a proxy for other undesirable effects |
| **Average Annual Difference** | The difference between the sustainable yield and the simulated groundwater pumping. A negative value is pumping in excess of the sustainable yield |
| **Percent Difference** | The percentage of the Average Annual Difference to the total groundwater pumping to provide context and a method to compare the significance of the difference in the pumping copmared to the sustainable yield. |

## TABLE 27: Summary of Statistical Analysis for Validation of C2VSimFG-Kern Historical Simulation

| Validation Measure | C2VSimFG-Kern | C2VSimFG-Beta | Percent Change |
|---|---|---|---|
| Units | Feet | Feet | Percent |
| Residual Mean | 17.3 ft | 32.6 ft | 47% |
| Residual Standard Deviation | 45.5 ft | 54.0 ft | 16% |
| Absolute Residual Mean | 37.4 ft | 56.8 ft | 34% |
| Root Mean Square (RMS) Error | 50 ft | 73.5 ft | 32% |
| Scaled Absolute Residual Mean | 0.061 | 0.092 | 34% |
| Correlation Coefficient | 0.76 | 0.52 | 47% |
| Number of Monitor Wells | 558 | 558 | same |
| Number of Observations | 42,075 | 42,075 | same |

**Notes**

| | |
|---|---|
| Observation Point | Location in the model where measured data from well is compared to simulated model results |
| Residual | Difference between measured and simulated groundwater elevations at an observation point |
| Residual Mean | Statistical measure of fit of simulated to measured data using sum of the residuals divided by the number of residual data values |
| Residual Standard Deviation | Statistical evaluation of the scatter of the data by calculating standard deviation of residuals |
| Absolute Residual Mean | Statistical measure of fit of simulated to measured data using sum of the absolute value residuals divided by the number of residual data values |
| Root Mean Square (RMS) Error | Statistical measure of fit of simulated to measured data using square root of the quotient of sum of squares of residuals by the number of observations |
| Scaled Absolute Residual Mean | Statisical measure to provide scale of validation using ratio of the absolute residual mean divided by the range of observed groundwater elevations |
| Correlation Coefficient | Scaled measure of the closeness of fit of simulated to measured data from -1 to 1 correlation with 1.0 a perfect correlation |
| Number of Monitor Wells | Number of wells where measured groundwater level data was compared to C2VSimFG-Kern simulation results for model validation |
| Number of Observations | Number of groundwater level measurements that were compared to C2VSimFG-Kern simulation results for model validation |

# APPENDIX M2

## Validation and Performance

## Assessment C2VSimFG-Kern Model

## Validation of C2VSimFG-Kern Performance

The C2VSimFG-Kern performs well within the central portion of the Subbasin. The model does not perform as well east of the Friant-Kern Canal or west of the California Aqueduct. The geologic and hydrogeologic conceptual models within the central portion of the Subbasin appear to be generally realistic. The geologic and hydrogeologic conceptual models appear to be very poor in the areas where the model does not perform well.

### C2VSimFG-Kern Validation

One of the concerns for the modeling is the overall calibration of C2VSimFG--Beta in Kern County. As discussed above, the assumption is that C2VSimFG--Beta was developed using reasonable care in developing the geologic framework and developing a consistent regional methodology for determining aquifer properties. An identified weakness of the C2VSimFG--Beta is the quality of data used in developing the overall water balance such as the extent of the water banking operations in Kern County. The issues with the water balance are considered the primary contributing factor affecting the calibration of the C2VSimFG--Beta; the hydrogeologic conceptualization is reasonably accurate for a regional planning analysis.

To address these concerns, a validation analysis was performed for C2VSimFG-Kern by comparing simulation results to field measured groundwater level data collected during the Study Period and comparing those to a similar set of residuals from the C2VSimFG--Beta model. The statistical results of this analysis should be comparable, if not better, for C2VSimFG-Kern compared to the C2VSimFG-Beta results.

The analysis used 42,058 groundwater levels measurements collected from 558 monitoring wells in the Subbasin. The data were collected by Kern County Water Agency, the Kern Fan Monitoring Committee, the DWR Water Data Library, and local agencies. For each location, the residual was calculated as the simulated groundwater level minus the measured groundwater level based on the well measurement data. A brief summary of the statistical measures used to evaluate the calibration results is provided below:

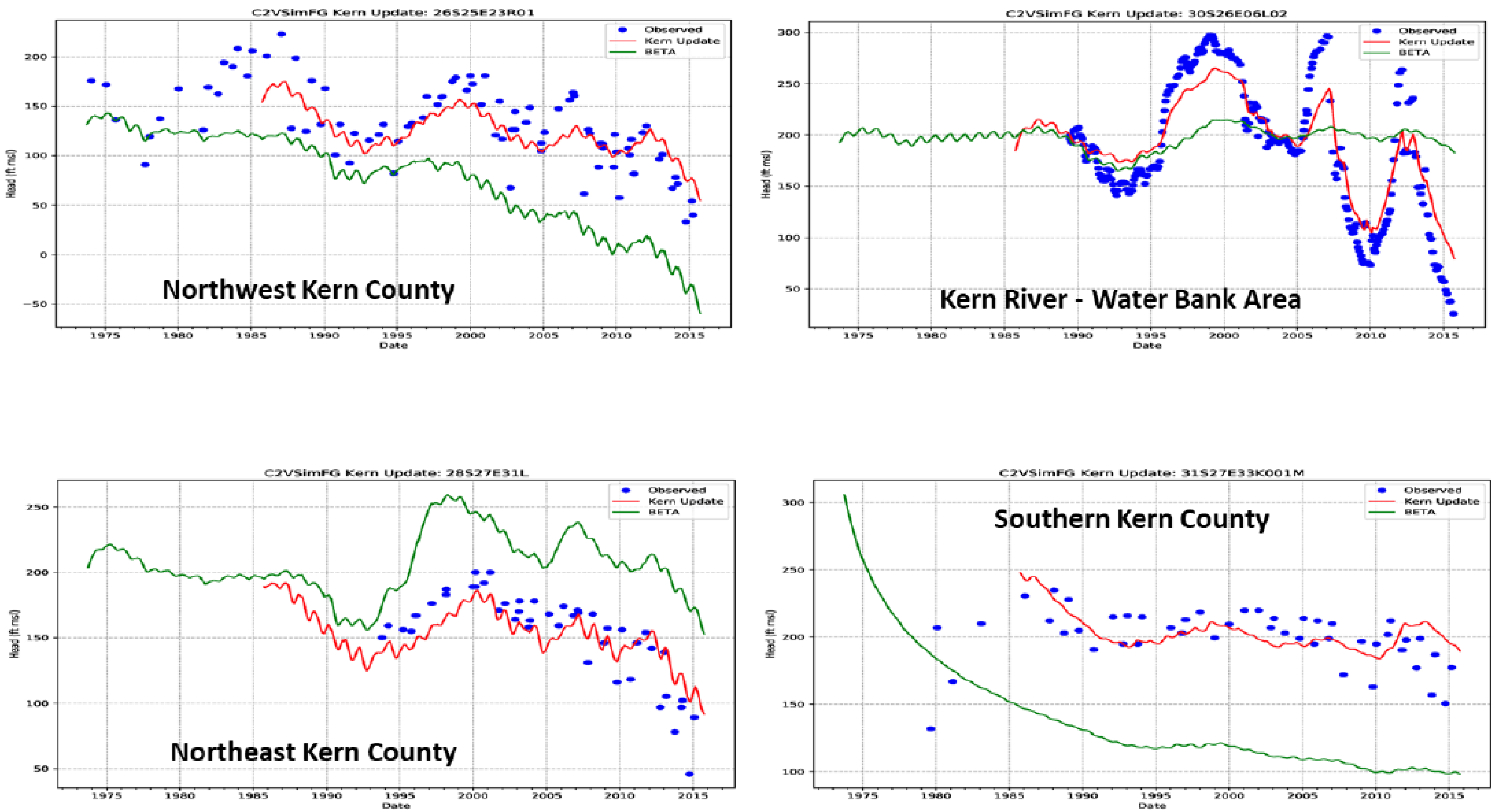
- The residual mean is computed by dividing the sum of the residuals by the number of residual data values. The closer this value is to zero, the better the calibration especially as related to the water balance and estimating the change in aquifer storage. The residual mean of 17.3 feet for C2VSimFG-Kern is an improvement of 47 percent over the 32.6 feet from C2VSimFG-Beta.
- The absolute residual mean is the arithmetic average for the absolute value of the residual, so it provides a measure of the overall error in the model. The absolute residual mean of 37.4 feet for C2VSimFG-Kern is an improvement of 34 percent over the 56.8 feet from C2VSimFG-Beta.

- The residual standard deviation evaluates the scatter of the data. A lower standard deviation indicates a closer fit between the simulated and observed data. The standard deviation is 45.5 feet for C2VSimFG-Kern, which is an improvement of 16 percent over the 54.0 feet from C2VSimFG-Beta.
- The Root Mean Square (RMS) Error is the square root of the arithmetic mean of the squares of the residuals and provides another measure of the overall error in the model. The RMS Error is 50.0 feet for C2VSimFG-Kern, which is an improvement of 32 percent over the 73.5 feet from C2VSimFG-Beta.
- The correlation coefficient ranges from 0 to 1 and is a measure of the closeness of fit of the data to a 1 to 1 correlation. A correlation of 1 is a perfect correlation. The correlation coefficient of 0.76 for C2VSimFG-Kern is an improvement of 47 percent over the 0.52 from C2VSimFG-Beta.
- Another statistical measure is the ratio of the standard deviation of the mean error divided by the range of observed groundwater elevations. This ratio shows how the model error relates to the overall hydraulic gradient across the model. The ratio for C2VSimFG-Kern is 0.061 feet, which is an improvement of 34 percent over the 0.092 from C2VSimFG-Beta.

Considering these results in context with the overall range of measurements of 616 feet, the residual mean of 17.3 feet represents a relative percentage difference of less than 3 percent for the absolute residual mean of 37.4 feet, the relative percentage difference is about 6 percent. Despite this improvement in model performance, the model is not considered fully calibrated. However, C2VSimFG-Kern is reasonably validated for assessing groundwater level changes on the Subbasin scale for the purposes of SGMA planning.

**Table 1. Summary of Statistical Analysis for Validation of C2VSimFG-Kern Historical Simulation**

| Validation Measure | C2VSimFG-Kern | C2VSimFG-Beta | Percent Change |
|---|---|---|---|
| Units | Feet | Feet | Percent |
| Residual Mean | 17.3 ft | 32.6 ft | 47% |
| Residual Standard Deviation | 45.5 ft | 54.0 ft | 16% |
| Absolute Residual Mean | 37.4 ft | 56.8 ft | 34% |
| Root Mean Square (RMS) Error | 50 ft | 73.5 ft | 32% |
| Scaled Absolute Residual Mean | 0.061 | 0.092 | 34% |
| Correlation Coefficient | 0.76 | 0.52 | 47% |
| Number of Monitor Wells | 558 | 558 | same |
| Number of Observations | 42,075 | 42,075 | same |




DRAFT

| Kern County Subbasin<br>Groundwater Sustainability Plan | Figure 9-31 – Representative Hydrographs Comparing Observed, C2VSimFG-Kern and C2VSim-Beta Results |
|---|---|
| Sources: | April 2024 CONSULTANT/USER INITIALS – Todd Groundwater |

**Figure 9-1. Representative Hydrographs Comparing Observed, C2VSimFG-Kern and C2VSim-Beta Results**

## Sensitivity Analysis

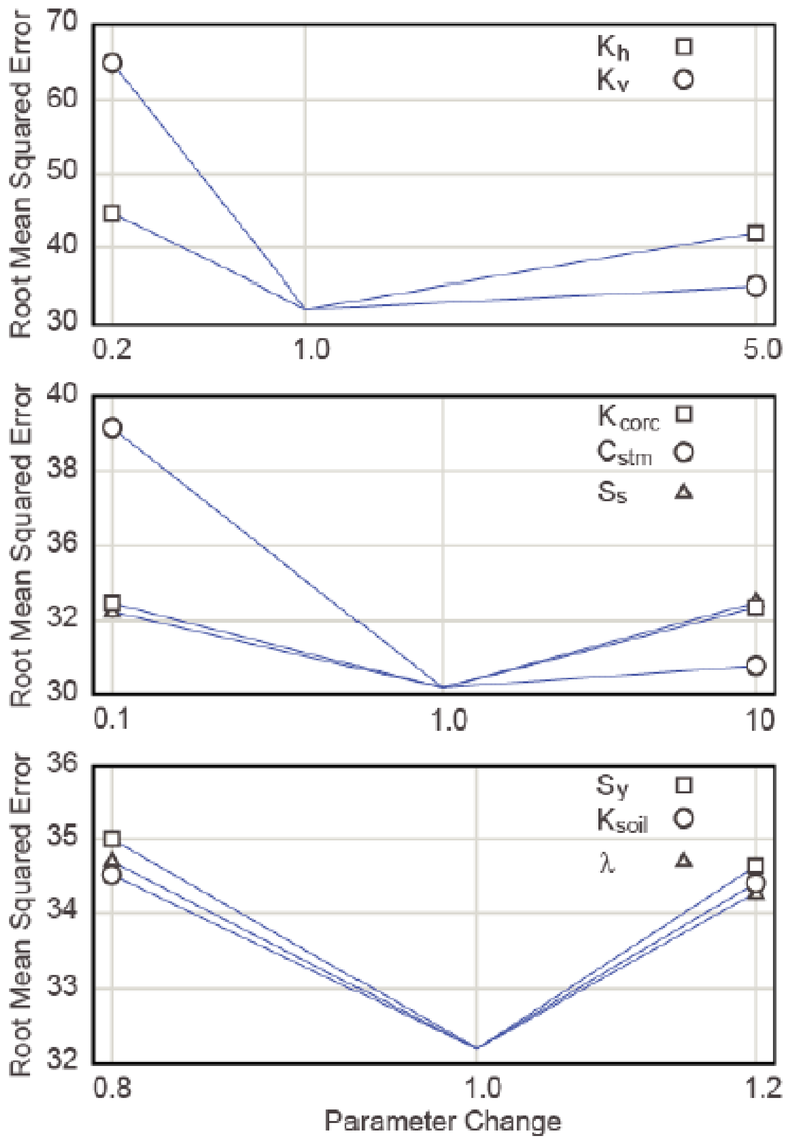
The C2VSimFG-Kern model was not formally calibrated. Some physical parameters were adjusted to improve model performance in specific areas. A sensitivity analysis was conducted on the adjusted model to understand how variations in model parameters affect model results. Eight physical parameter sets were systematically varied, and model results compared to the base model for a selected group of groundwater hydrographs. C2VSimFG-Kern parameter sensitivities evaluated for Subbasin include:

- Horizontal hydraulic conductivity of aquifer (Kh)
- Vertical hydraulic conductivity of aquifer (Kv)
- Vertical hydraulic conductivity of Corcoran Clay aquitard (Kcorc)
- Streambed conductance of Kern River (Cstm)
- Specific storage of aquifer (Ss)
- Specific yield of aquifer (Sy)
- Soil hydraulic conductivity in root zone (Ksoil)
- Soil pore size distribution index in root zone (

The Root Mean Squared Error between observed and simulated values was calculated for the original parameter set and after varying each parameter set upward and downward by a set factor. Results are shown in **Figure 9-32**. This sensitivity analysis shows that the hydrologic parameter values in the C2VSimFG-Kern model are generally within an acceptable range. A full model calibration would likely improve model performance.

## Peer Review Process

Todd Groundwater worked with Woodard and Curran (W&C) throughout the model development process as W&C conducted an on-going peer review of model input files. W&C staff have developed several IWFM-based models and worked with DWR to develop C2VSimFG-Beta. Their reviews helped ensure that the model update used best practices when incorporating new data. The peer review process was documented in a series of meeting summaries to the KGA and KRGSA. The updated C2VSimFG-Kern input files for the Subbasin were shared with DWR for incorporation into future C2VSim public releases.




**Notes:**
**Sensitivity parameters modified and evaluated for Kern County Subbasin**
**Kh – horizontal hydraulic conductivity of aquifer**
**Kv – vertical hydraulic conductivity of aquifer**

**Kcorc - horizontal hydraulic conductivity of Corcoran Clay aquitard or equivalent**
**Cstm – streambed conductance of Kern River and Poso Creek**
**Ss – specific storage of aquifer**

**Sy – specific yield of aquifer**
**Ksoil –soil hydraulic conductivity in root zone**
**Λ –soil pore size distribution index in root zone**

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| Kern County Subbasin Groundwater Sustainability Plan | Figure 9-32 C2VSimFG-Kern Sensitivity Analysis Results |
|---|---|
| Sources: | April 2024 CONSULTANT/USER INITIALS – Todd Groundwater |

**Figure 9-2. C2VSimFG-Kern Sensitivity Analysis Results**

In addition, Dr. Charles Brush of Hydrolytics LLC was added to the modeling team. As an early developer of C2VSim for DWR, Dr. Brush provided his experience and expertise with the C2VSim to support the development of C2VSimFG-Kern. This collaborative effort provided further assurance that the model updates and revisions were conducted in an appropriate manner for water budget development consistent with DWR model update practices.

The more general assumptions in C2VSimFG--Beta were replaced with local data and knowledge that are regionally or locally significant for WY1995 to WY2015. This update employed a phased approach with regular peer reviews.

1) Phase 1 revisions address components of Regional Significance that require significant changes to the overall model input file structure. These include:
    a) Surface water delivery volumes, application areas and use by water district.
    b) Water banking recharge, recovery, and application of recovered water.
    c) Evapotranspiration rates and irrigation demand based on ITRC METRIC data (ITRC 2017).
    d) Urban population and per capita demand, including addition of an urban zone for Metropolitan Bakersfield.
    e) Addition of groundwater extraction wells for water banking projects.
2) Interim Review
    a) The Woodard & Curran Peer Review Team.
    b) Subbasin water districts and purveyor's local data review.
    c) Stakeholder input.
3) Phase 2 revisions address components of Local Significance that generally require modifications of input data and parameters within the existing C2VSim model input file structure. These include:
    a) Local water sources and demands of significance to individual Districts/GSAs.
    b) District pumping for in-district delivery via surface water canals where significant.
    c) District recharge operations utilizing canals, stream channels, and basins.
    d) Wastewater disposal and land application.
    e) Review and limited adjustment of model parameters.
4) Interim Review by same reviewers listed in item 2.

5) Phase 3 revisions include addressing comments and incorporating new data from the Interim Reviews.

6) Interim Review by same reviewers listed in item 2.

7) Tabulate model-derived water budgets for Peer-Review and GSP Use.

In each update phase, historical and current water budgets for zones representing water agency service areas were produced with the revised C2VSimFG-Kern model incorporating corrected local data. These water budgets were shared with participating agencies for review, to ensure that C2VSimFG-Kern correctly represented local water balances. Where necessary, participating agencies provided additional data which was incorporated into C2VSimFG-Kern.

## Internal Review Process

Todd Groundwater and Hydrolytics LLC worked collaboratively on this model revision, water budget development and the projected future scenarios. Throughout this work, efforts were applied to improve data management to develop a systematic process for generating model input files. Using this approach, internal review could be conducted with each firm reviewing the contributions from the other. The goal was to accurately represent the data provided by the Kern County agencies in the model.

Due to schedule constraints, a thorough internal review of the projected future model scenarios was not completed prior to the submission of the Public Review Draft of the model results on August 30, 2019. A thorough review of all input for the projected future scenarios was conducted in September and October 2019. During this review, several issues were identified and corrected. As a result, the results in this report vary from those provided in the August 2019 Public Review Draft. Although the numbers changed, the overall conclusions from the C2VSimFG-Kern simulations remained essentially the same.

## Model Modifications

**☑ 23 CCR § 354.18(f)**

In general, the C2VSimFG-Kern was revised to better represent the managed water supply and demand for the Subbasin. During the course of this revision, several issues were identified with the hydrogeological conceptual model and simulation parameters that affected the historical water budget. The following sections summarizes modifications made in C2VSimFG-Kern to improve the model performance. Other issues identified regarding the hydrogeological conceptual model, model setup and simulation parameters that were not addressed in C2VSimFG-Kern but are recommended to be modified for future model updates, are listed in **Section 9.7.5**. A summary of the changes that were made in C2VSimFG-Kern are provided below.

### *Streambed Parameters*

In the Subbasin, the Kern River and Poso Creek are the two largest streams. Both have multiple stream gauges along their courses including ones near where they enter the Subbasin from the Sierra Nevada. These are the only streams that are simulated in the model using the IWFM stream module. Both are losing streams where surface water recharges groundwater but due to the great depth to groundwater in the principal aquifers they are not considered interconnected with the principal aquifer groundwater system, except during limited periods near the major water banking operations west of Bakersfield when multi-year periods of recharge operations produce high groundwater levels.

As a part of the C2VSimFG-Kern update, the simulated recharge from the Kern River and Poso Creek were compared to changes in stream gauge measurements and estimated streambed losses to evaluate how well the model was simulating streambed seepage. For much of the Kern River, the amount of streambed seepage is estimated based on daily weir information and is documented in the annual Kern River Hydrographic Reports. The streambed parameters used in C2VSimFG Beta do not provide a comparable volume and distribution of seepage along the Kern River streambed. In dry years, streamflow was not reaching far enough downstream whereas in wet years the seepage was too low. Similarly, the Poso Creek streambed seepage showed similar issues based on comparisons to differences in stream gauge data along its course.

To address this, the Kern River and Poso Creek streambed parameters were manually modified until a reasonable approximation of the measured streambed seepage was achieved by C2VSimFG-Kern. In general, the streambed conductance was lowered whereas the stream wetted perimeter was increased. This provides the best balance in matching the measured dry, average, and wet years flows in both streams.

Part of this issue is that C2VSimFG--Beta uses a simple form of the stream module in the simulation. This approach appears to work sufficiently well for the continuously flowing streams in the northern parts of the Central Valley but is not sufficient for simulating the highly variable flows that occur on the Kern River and Poso Creek. It is recommended that future revisions to C2VSimFG-Kern further evaluate issues in simulating streamflow and seepage in the Kern River and Poso Creek (see **Section 8.5**). This may include incorporating more advanced streamflow simulation features that are available in IWFM but that have not been utilized in C2VSimFG-Kern.

### *Small Watershed Runoff*

In reviewing the small watershed contributions, it was determined that the runoff does not represent the variable nature of runoff in an arid region. Although this was not part of the originally planned model revisions, it affected the model results. Todd

Groundwater revised the corresponding model parameters to be more representative of the local arid conditions in Kern County.

Runoff of precipitation from the surrounding small watersheds is calculated within C2VSimFG-Kern using methodology included in IWFM that is based on the SCS Curve Number Method (NRCS, 2004). The C2VSimFG-Beta results showed a steady baseflow that contributed water to the Subbasin continuously and did not show the appropriate variation in runoff expected between wet, average, and dry years in the arid environment.

Two major issues were identified and revised. First, the SCS curve number was changed to allow a higher percentage of runoff in wet years to capture the flashy nature of runoff from these watersheds during differing climatic conditions. Second, IWFM uses a localized soil moisture water budget; however, soil, ET, and other parameters are set that allow for the continuous outflow from the basins. These were changed to more appropriate values that limit baseflow from the very small watersheds while allowing baseflow from the larger watersheds. Parameters were varied to better match estimated watershed runoff from a local USGS study (Nady and Larragueta, 1983).

#### *Root Zone Parameters*

Areas with low permeability soils, such as lake beds and shallow clay areas, were found to have overly high volumes of deep percolation that required additional groundwater pumping to meet the overall water demand for irrigation. This issue was noted by Subbasin GSAs who recognized that the groundwater pumping and deep percolation from preliminary model results were significantly higher than what was found in practice. A review found areas of overlying hydraulic conductivity and other hydraulic parameters that caused this high percolation rate. Two types of issues were found. First, very high root zone parameters are present in parts of the Subbasin that are not consistent with local soil data. Second, the root zone hydraulic parameters for lakebed and other heavy clay soil areas are too high. These areas were manually adjusted to be more in line with observed conditions. A more rigorous development of root zone parameters should be considered in the future as this issue demonstrates that it is a sensitive parameter.

#### *Land Use Modifications*

The agricultural land use and crop type distribution in the model for early period (1974 to 1990 and 1992 to 1996) from C2VSimFG-Beta uses a regional distribution and does not accurately represent historical practices. This results in agricultural water use being distributed across the entire Subbasin including areas that do not have irrigated agriculture. To correct for this, land use and crop type data are modified to conform with irrigated agricultural areas in the early 1990s. The crop types are adjusted to be consistent with the Kern County Agricultural Commissioner reports for these years. This included capturing the appropriate crop types present in the Subbasin in the periods from 1974 through 1996. For example, there was a higher percentage of cotton produced during that period and a lower percentage of nut trees, which became one of the major crop types in the 2010s.

#### *Westside Pumping Limits*

Western Kern County contains large areas with poor groundwater quality. As a result, little or no agricultural or urban groundwater pumping occurs in this area. To simulate this, groundwater pumping was turned off in C2VSim-Kern in most of the areas with poor groundwater quality. However, in the Westside District Water Authority GSA, limited groundwater pumping does occur during critically dry years. To protect crop health, the poor-quality water must be blended with surface water to supplement the imported water supply. To simulate this condition, the groundwater pumping rate in the Westside District Water Authority GSA is estimated to be 10 percent of the surface water deliveries, and the automated groundwater pumping adjustment in C2VSimFG-Kern was turned off for these areas.

Subsequent to the completion of the historical model, GSP developers in the WDWA GSA refined their estimate of groundwater pumping used to blend with delivered surface water to about 3,000 AFY on average, which is considerably lower than that used in the historical model. The Westside GSA GSP developers included a management action to further refine the estimated groundwater use in the WDWA GSA. Therefore, the original assumption was left in this version of the historical model. The results of WDWA GSA's pumping evaluation will be included in  future model updates.

#### *Kern Wildlife Refuge Pumping*

C2VSimFG-Beta enabled groundwater pumping in the model elements representing the Kern National Wildlife Refuge (Refuge). The Kern National Wildlife Refuge Water Management Plan (USBR, 2011) indicates that during the simulation time period, the Refuge was sustained entirely on imported surface water and occasional diversions of Poso Creek flood waters. No groundwater was pumped at the Refuge during the simulation period 1985 to 2015. Groundwater pumping was used at some time in the past. Groundwater pumping and automated groundwater pumping adjustment are turned off for all model elements in the Refuge.

In addition to the Refuge, former rice fields and other areas are currently used for sustaining ponds at private duck hunting clubs in the northwestern portion of the Subbasin. Water use data for these operations were not available during the development of the historical model. This water includes a combination of surface water and groundwater, and this volume is considered to be very small relative to the overall Subbasin water use. GSP developers included a management action to further refine the estimated water use for these facilities that will be addressed in future updates.

## Recommendations for Future Improvements to C2VSimFG-Kern

The C2VSimFG-Kern model performs well in most parts of the Subbasin, producing simulated water budget components that generally match historical values compiled by local agencies. C2VSimFG-Kern simulated groundwater levels provide a reasonable approximation of observed groundwater levels in the central part of the Subbasin. The model is well suited in most parts of the Subbasin for estimating the impacts of management actions on Subbasin groundwater storage and is also well suited as a planning tool in meeting SGMA compliance.

During the model update, several outstanding issues were identified that are currently being addressed in future updates to C2VSimFG-Kern. These data gaps are being addressed under the grant funded Basin Study and Evapotranspiration Analysis & Study grant components (Section 9.1.5). This grant period is October 2022 to October 2025.

- **Improve streamflow simulations of the Kern River and Poso Creek.** Flows in the Kern River channel, including local stream-groundwater interactions, are not well replicated and surface water diversions are not dynamically simulated. Some rejected recharge occurs in the Kern Fan area in very wet years, with significant outflow of groundwater to the Kern River especially in the Kern Fan banking area (i.e., rejected recharge). This has been an ongoing issue and needs to be addressed for the projected future water budgets so that banking recharge volumes can be better matched in the model. It is recommended that future revisions to C2VSimFG-Kern further evaluate issues in simulating streamflow and seepage in the Kern River and Poso Creek (see **Section 8.5**). This may include incorporating more advanced streamflow simulation features that are available in IWFM but that have not been previously utilized in developing C2VSim models by DWR. Changing the stream simulation feature may require development of a local Subbasin model.
- **Improve the geologic and hydrogeologic conceptual model of the Kern County portion of the Central Valley.** A hydrogeologic conceptual model is a framework for understanding where groundwater exists, where it flows, and how groundwater interacts with surface water bodies and the land surface. A geologic conceptual model provides a framework for understanding the geologic features that control groundwater movement. Quantitative analysis of Subbasin groundwater flow is severely hampered by the lack of detailed geologic and hydrogeologic conceptual models of the areas outside the central alluvial basin. Geologic and hydrogeologic conceptual models will provide a foundation for the quantitative analysis of the groundwater flow system, and the framework for modeling the system. Key steps are:

  - Develop detailed geologic and hydrogeologic conceptual models of the Subbasin.
  - Identify the locations and characteristics of natural features that affect groundwater recharge and movement (faults, ridges, clays).
  - Understand water occurrence and movement in areas outside the central Subbasin.
  - Develop water quality maps (natural constituents and anthropogenic constituents).
  - Modify the Subbasin model to conform to the updated conceptual models.
- **Simulation of deep percolation and small watersheds.** Unreasonably high deep percolation (return flows) of the applied water in some areas has led to unreasonably elevated pumping rates to compensate. One problem is high root zone hydraulic parameter values in certain areas that were identified and corrected to better reflect local soil conditions. Because the excess pumping was returning to groundwater, the change has little effect on the Subbasin change in storage, but the pumping and deep percolation are now more in line with local estimates.  Root zone hydraulic parameters should be redeveloped throughout the Subbasin to assure model values are representative of actual values.
- **Root Zone Parameters,** Areas of overly high root zone hydraulic parameters led to high volumes of deep percolation that required additional groundwater pumping to meet the overall water demand for irrigation. A review found areas of overlying high soil hydraulic conductivity and other soil parameters produced percolation rate that were too high. These areas were manually adjusted to be more in line with observed conditions. A more rigorous development of root zone parameters should be considered in the future as this issue demonstrates that it is a sensitive parameter.
- **Investigate development of a stand-alone Subbasin model.** The C2VSim model provided by DWR and updated with local data is adequate for GSP preparation. However, this model may not meet all the groundwater modeling needs of Subbasin stakeholders.  In addition, running a full Central Valley simulation model imposes longer model run times and reduces model flexibility. Stakeholders should undertake a comprehensive study to develop a list of their integrated (groundwater and surface water) modeling needs, and then decide whether further improving C2VSimFG-Kern or developing a new integrated hydrologic model is the best way to address the Subbasin modeling needs.
- **Adjust the finite element grid to honor water management boundaries.** The C2VSimFG-Kern model grid is a randomly generated grid that does not conform to any local features other than natural surface water channels. This

limits the spatial accuracy of model inputs and the precision and flexibility of water budget outputs. Adjusting the grid to match district and agency boundaries, historical delivery areas, water management units within districts, and geologic and hydrologic features would greatly enhance model capabilities.

- **Quantify boundary flows.** Significant uncertainty exists regarding the rates and timing of groundwater flows into the Subbasin from surrounding watersheds, and groundwater flows from the Subbasin to Kings and Tulare counties to the north. Reliable estimates of boundary flows will improve model performance in boundary areas.
- **Kern County Subbasin Boundary.** The GSAs in the Subbasin should consider when DWR updates the Bulletin 118 to investigate the “actual” Subbasin and to remove those peripheral lands where aquifer connectivity does not exist.
- **Utilize more complex water management features of IWFM.** The Kern Update process modified information within the existing C2VSimFG--Beta model structure to improve model performance within the Subbasin. The IWFM application has several features that could be further utilized to improve model performance.
  - Adjust the agricultural crops to better match the Kern County crop mix (for example, create separate crop categories for carrots, young and mature almonds, young and mature pistachios, etc.).
  - Implement multi-cropping with semiannual or quarterly land use.
  - Some C2VSim data are organized by DWR subregions, which represent heterogeneous areas with homogeneous data. Developing Subbasin subregions and organizing model input data by these subregions may provide a better representation of local hydrologic conditions.
- **Calibrate the improved model for the Kern County Subbasin**. DWR did not fully calibrate the Kern County portion of the C2VSim model, owing to both poor historical input data and a lack of calibration data sets. The Kern Update process significantly improved the historical data in the model, developed some calibration data sets, and included limited adjustment of model parameters. The updated model performs adequately in the central part of the Subbasin and poorly in areas outside the central part of the Subbasin. Once the above improvements are completed, the Kern County portion of the resulting model should be fully calibrated to ensure that it performs well throughout the Subbasin.

#### *Future Work to Address Data Gaps*

The Kern County Subbasin received a Round 1 sustainable groundwater management (SGM) grant for critically overdrafted basin under the Sustainable Groundwater

Management (SGM) Grant Program SGMA Implementation grant authorized by the California Budget Act of 2021 and Proposition 68 for projects that encourage sustainable management of groundwater resources that support SGMA. The contract between DWR and the representative for the Kern County Subbasin GSAs was signed on August 8, 2022. **Section 9.1.5** provides a summary of the grant components associated with addressing data gaps related to the water budget.

# APPENDIX M3

## Hydrographs of Groundwater Elevations

## Projected-Future Scenarios

## Kern County Subbasin

## Projected-Future Scenario Hydrographs

The C2VSimFG-Kern results were used to assess whether the simulated groundwater levels would meet the minimum threshold and measurable objective for each monitoring well. Because C2VSimFG-Kern is not fully calibrated, the results are presented as relative change (which does not require calibration) instead of simulated groundwater levels using the superposition method. Future change in groundwater levels have been determined for each of the 186 locations for each of the six projected future scenarios. The change is calculated starting with the simulated March 2015 groundwater levels from the model. The change in groundwater level is then applied to the measured March 2015 groundwater level at the monitoring location. The result was to superimpose the simulated change in groundwater levels from the projected future C2VSimFG-Kern scenarios relative to the measured March 2015 groundwater level.

In general, across most areas of the Subbasin, groundwater levels fall near or below the minimum thresholds without the SGMA projects and management actions but are typically above the minimum threshold for the scenarios that include the SGMA projects and management actions.  The groundwater hydrographs for some locations, especially along the eastern and western Subbasin margins, show an unusual pattern that is likely influenced by issues with the hydrogeological conceptual model incorporated into C2VSimFG-Kern for these locations. The hydrographs for these areas are not considered to be representative of actual conditions that would physically occur. This is a limitation to the model. The model is currently undergoing a rigorous model update be conducted to revise the hydrogeological conceptual model to be consistent with that presented in the Subbasin GSPs. In addition, further calibration of C2VSimFG-Kern is recommended to update aquifer parameters in the Subbasin.

The Subbasin GSAs have defined 186 locations spread across the Subbasin. Minimum thresholds and measurable objectives have been assigned at each of these locations, and the hydrographs for all locations are provided following this text.

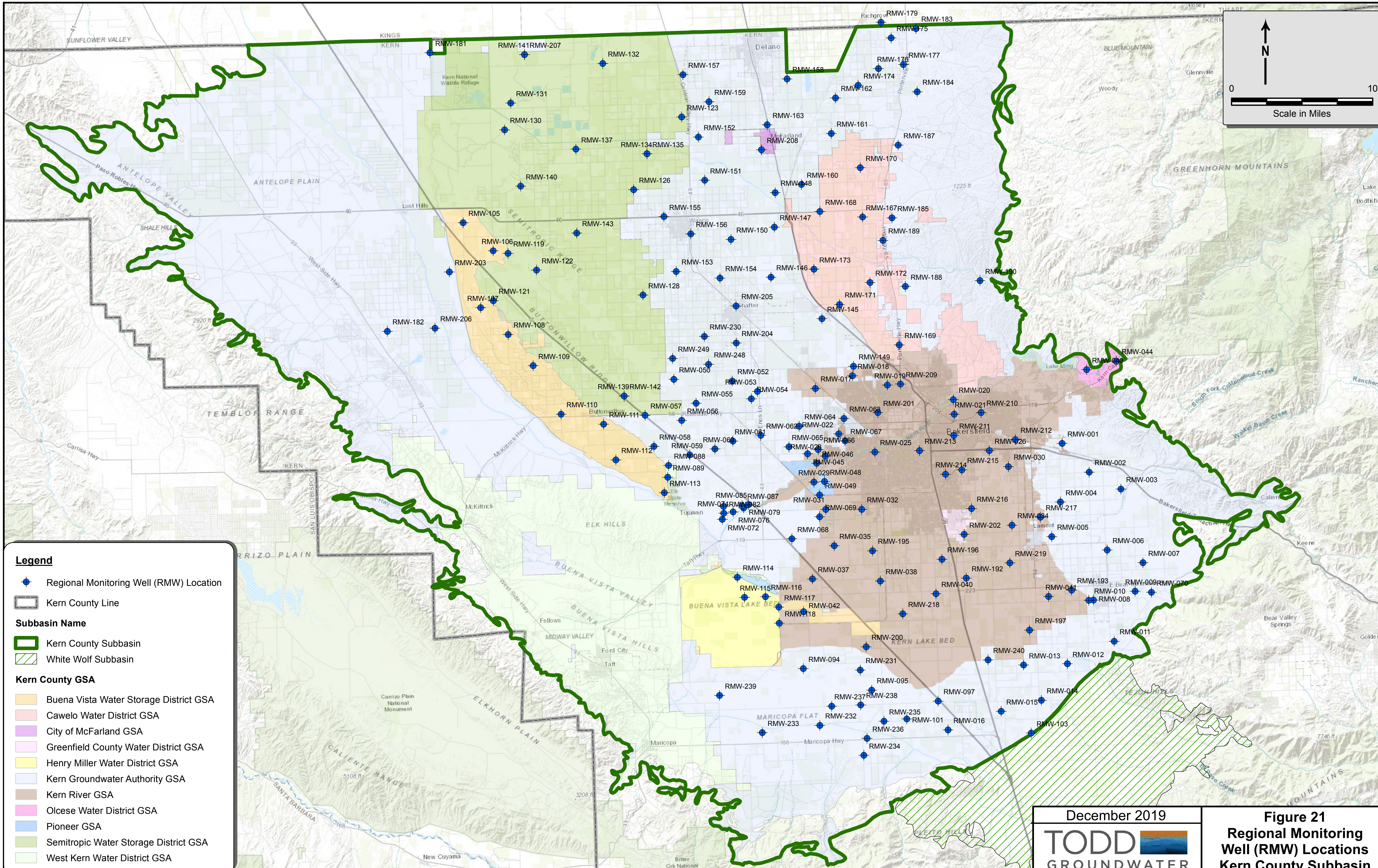
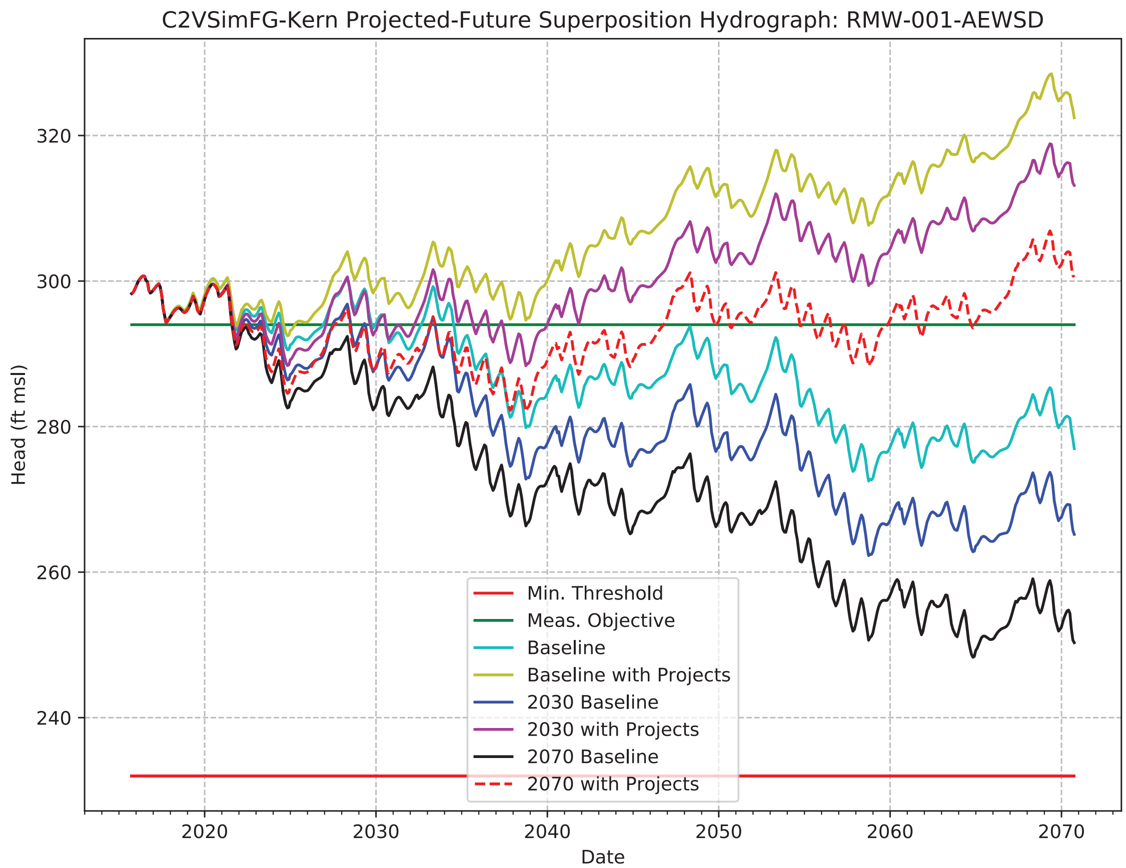
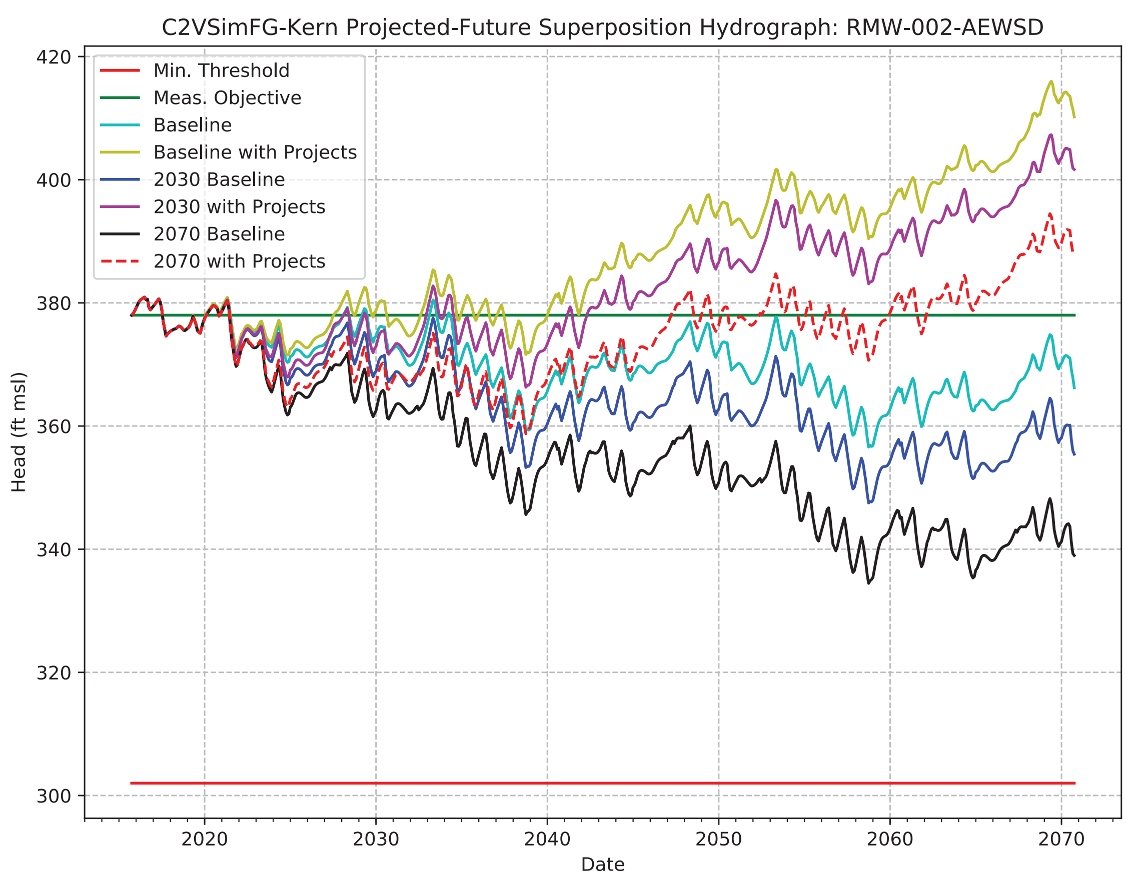


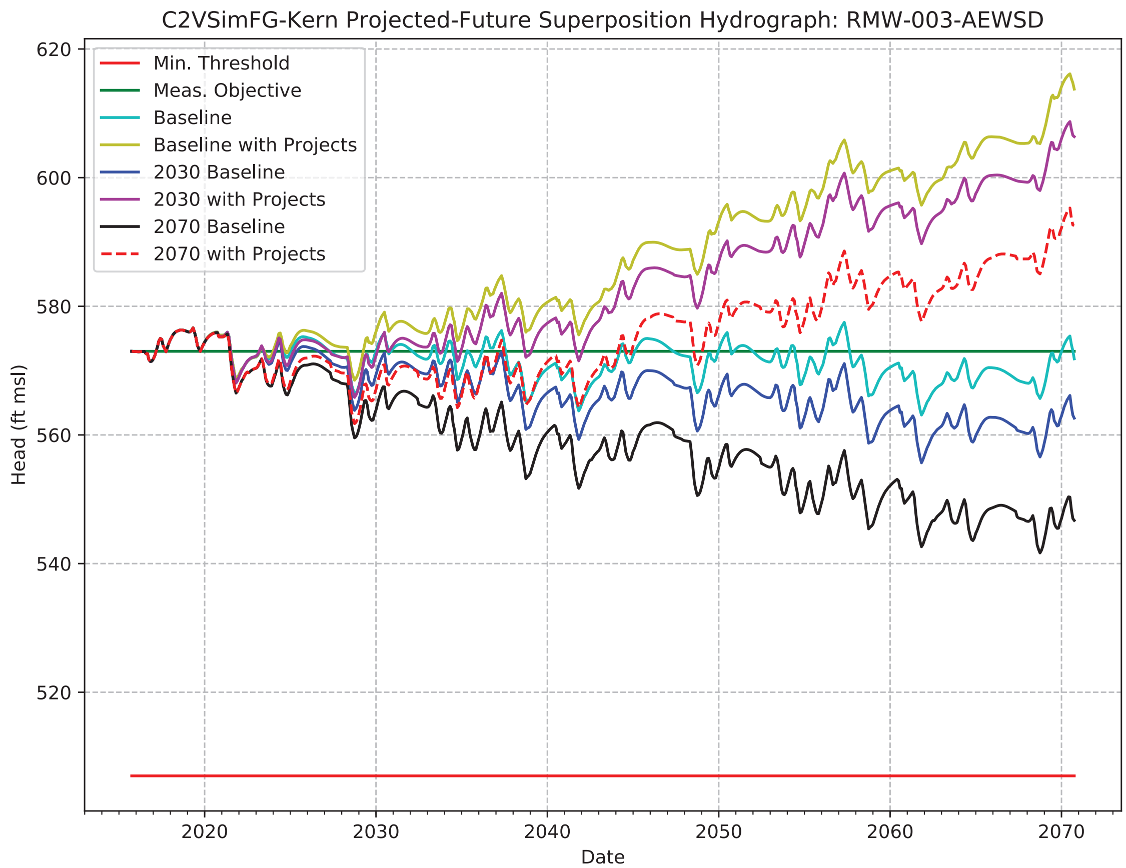

Figure 21
Regional Monitoring Well (RMW) Locations
Kern County Subbasin

# Projected-Future Scenario Hydrographs

# C2VSimFG-Kern Model


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-001-AEWSD
Head (ft msl)
320
300
280
260
240
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-002-AEWSD
Head (ft msl)
420
400
380
360
340
320
300
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
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Head (ft msl)
620
600
580
560
540
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2020
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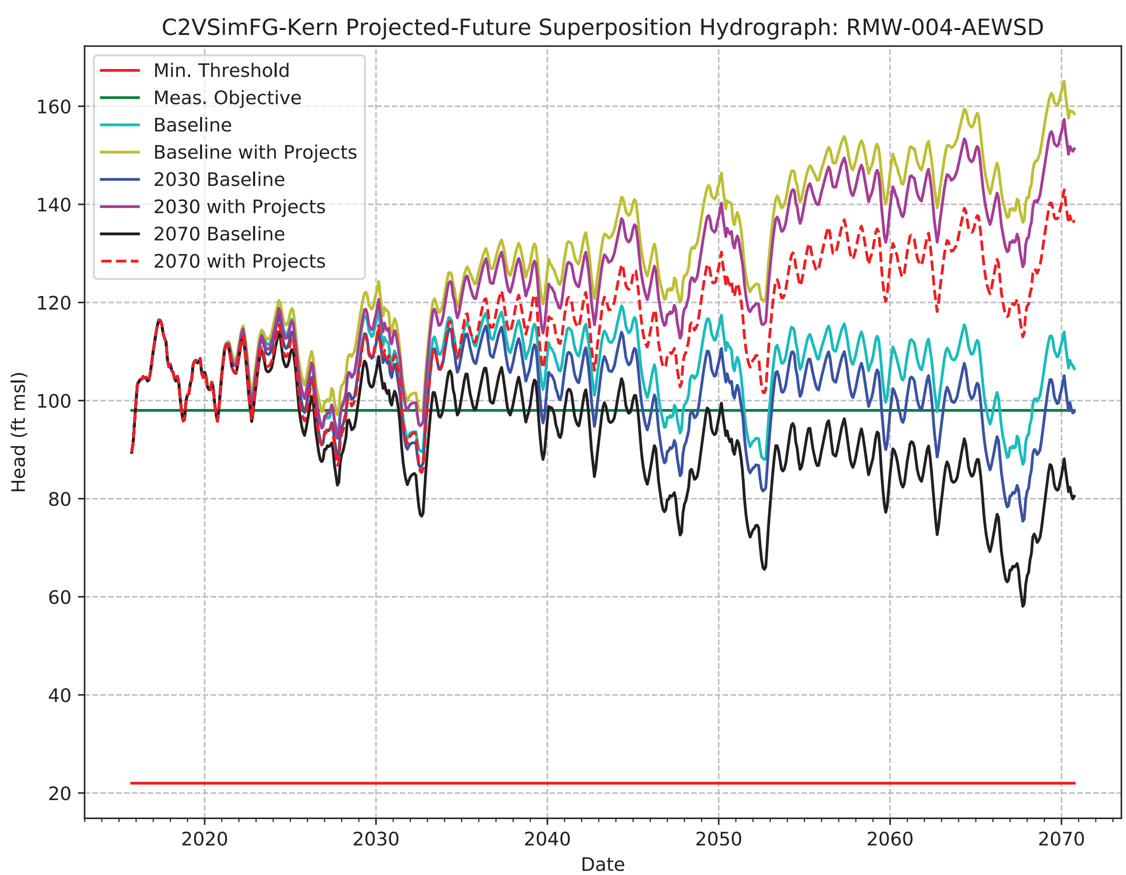
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-004-AEWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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140
120
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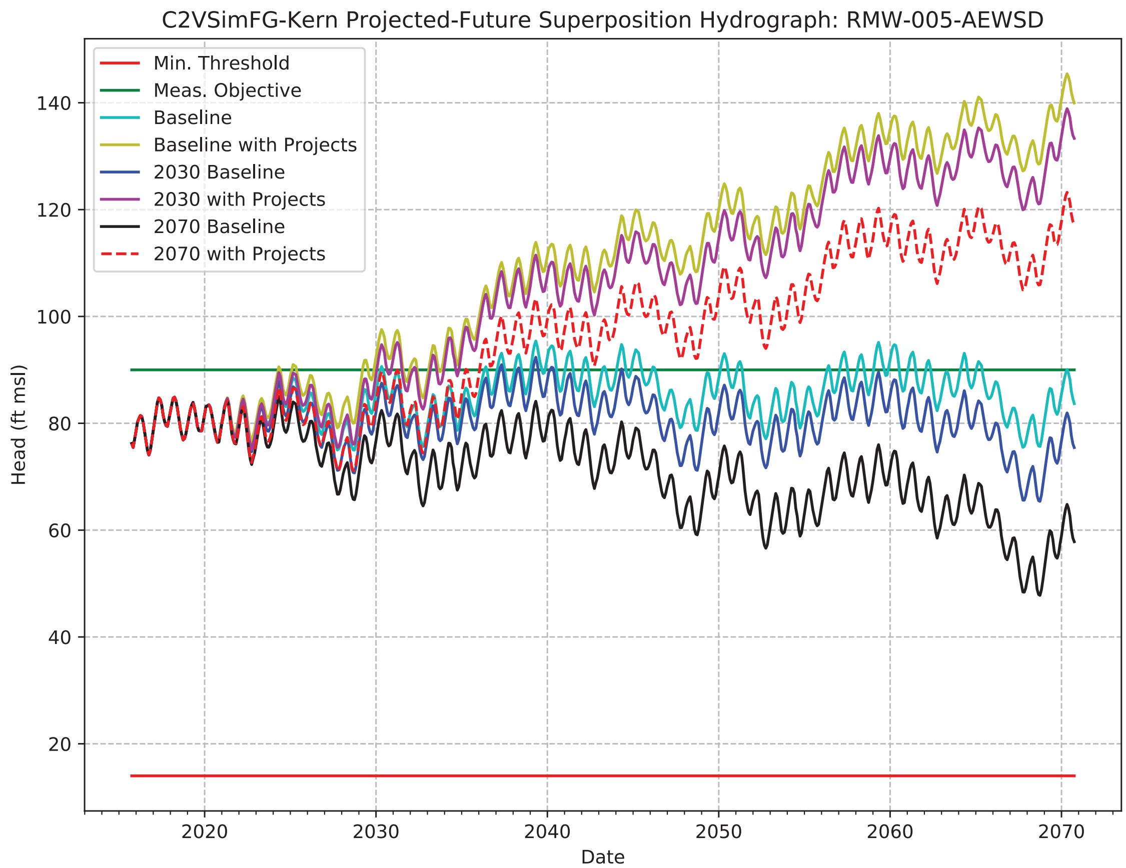
2070
Date



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-005-AEWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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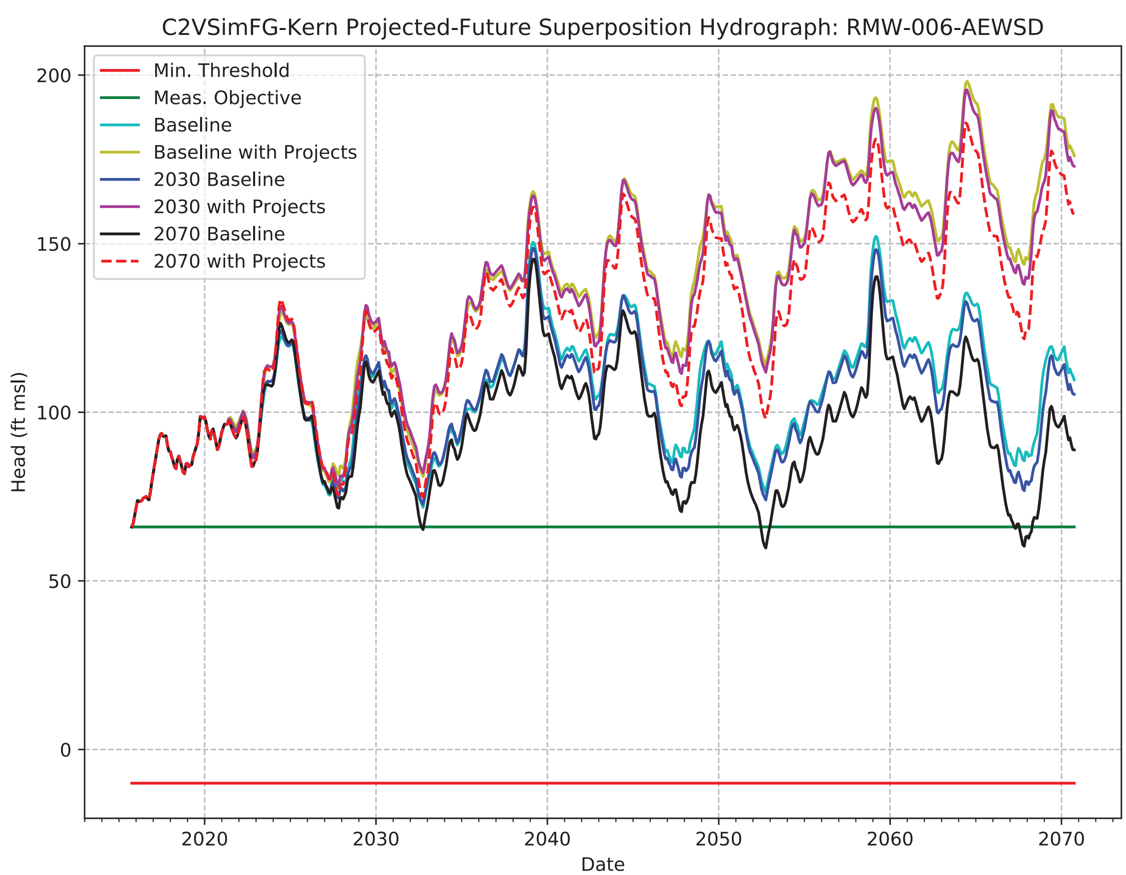
2040
2050
2060
2070

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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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Head (ft msl)
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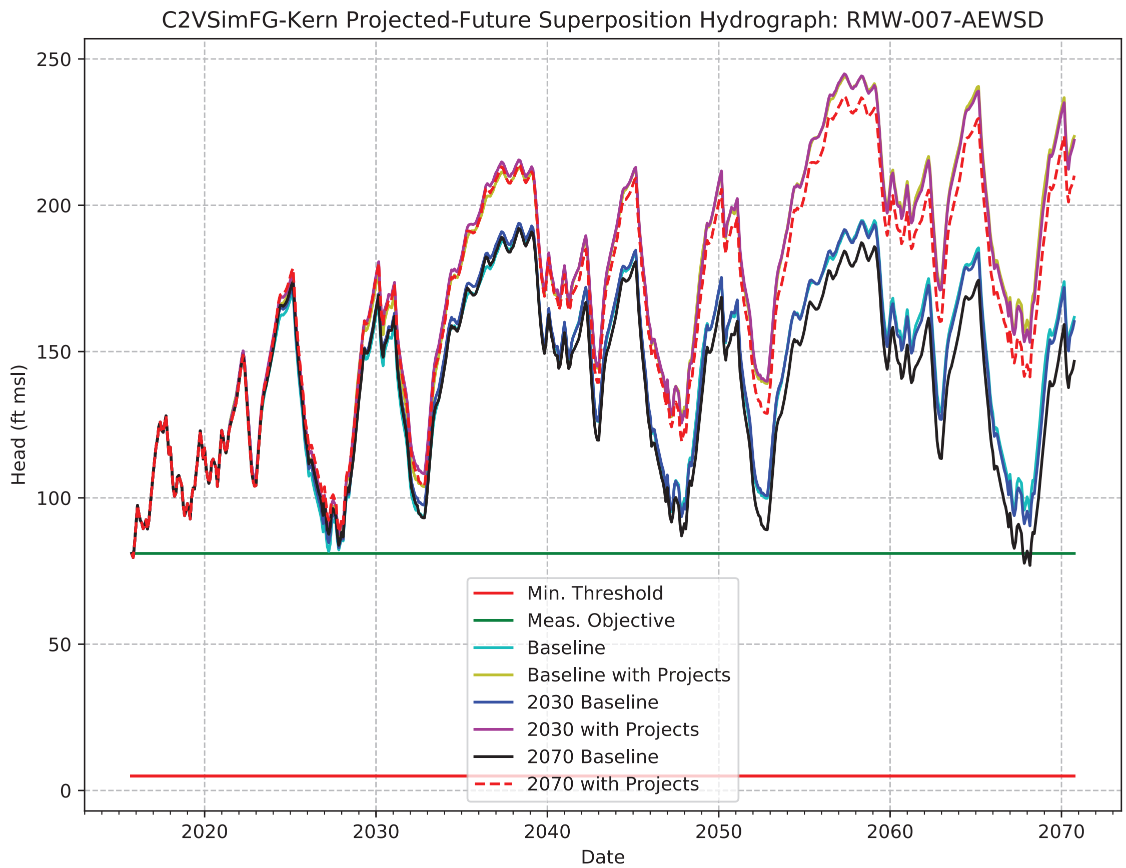
2040
2050
2060
2070



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-007-AEWSD
Head (ft msl)
Date
250
200
150
100
50
0
2020
2030
2040
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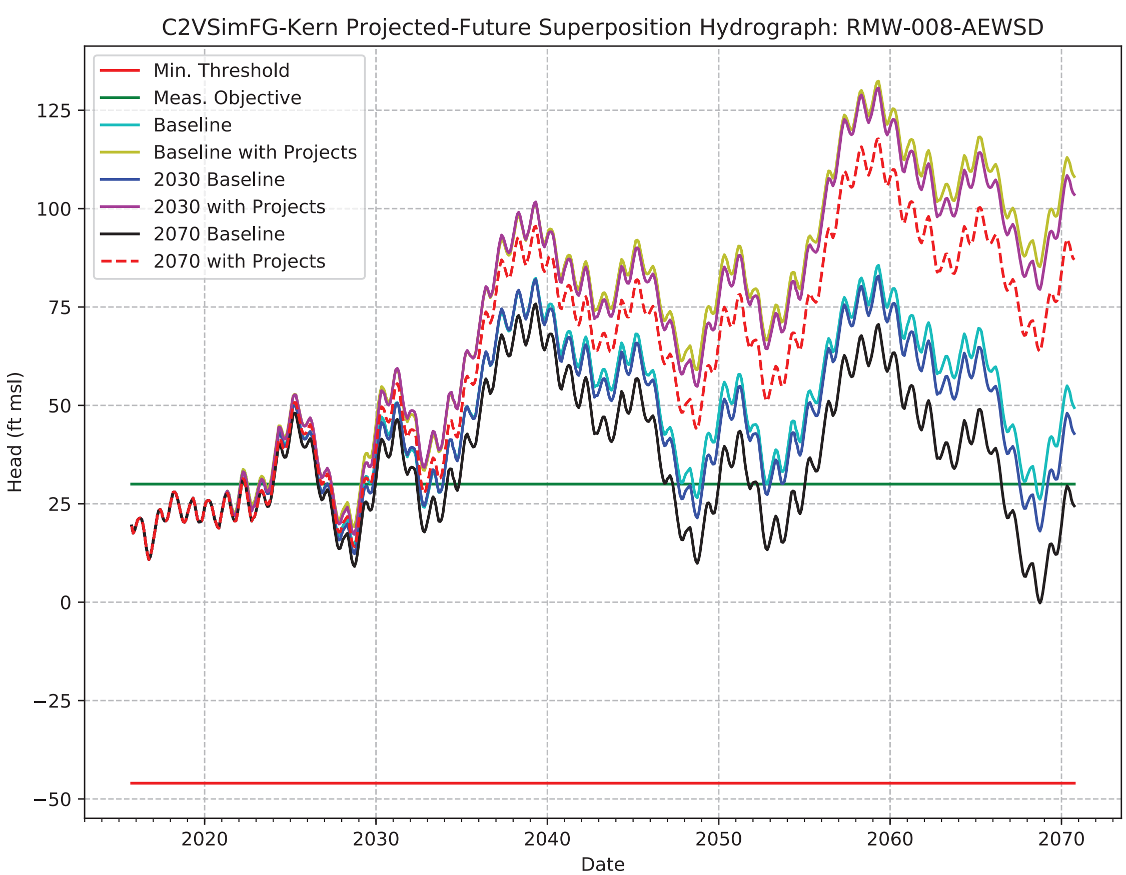
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-008-AEWSD
Head (ft msl)
Date
125
100
75
50
25
0
−25
−50
2020
2030
2040
2050
2060
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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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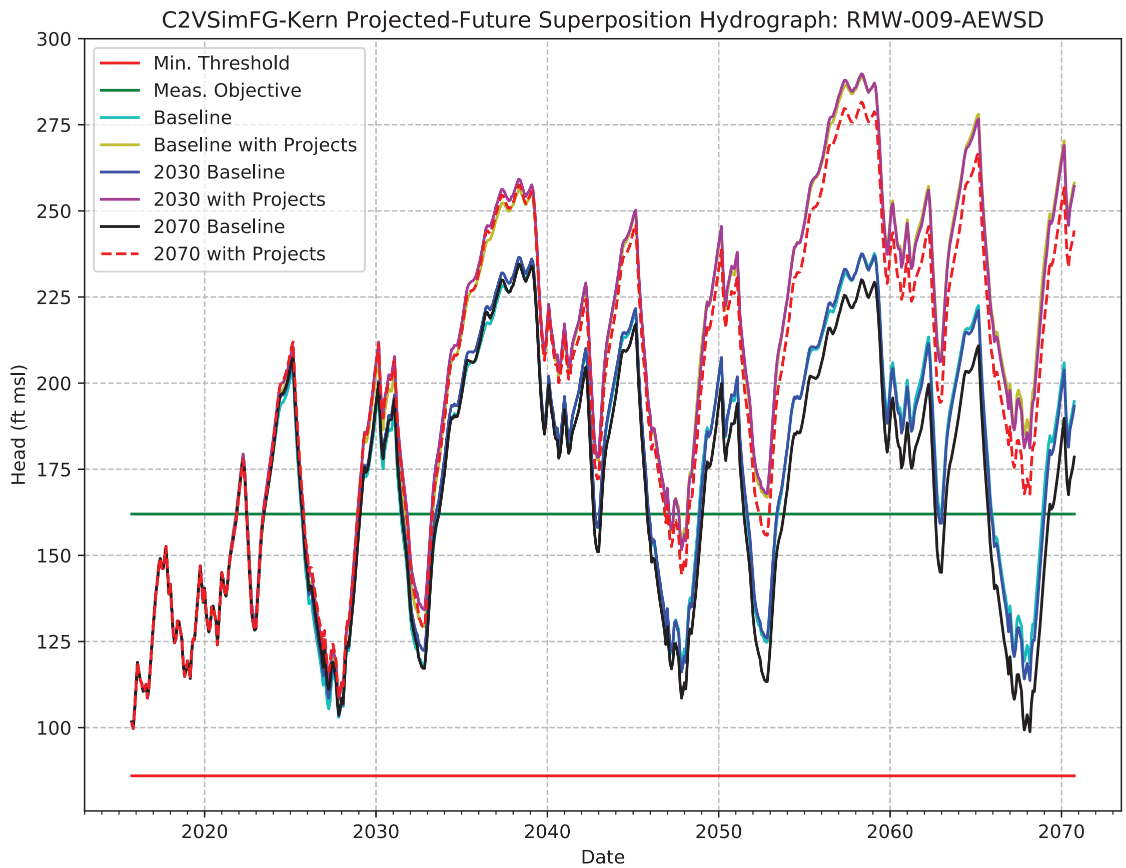
2070 Baseline
2070 with Projects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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
300
275
250
225
200
175
150
125
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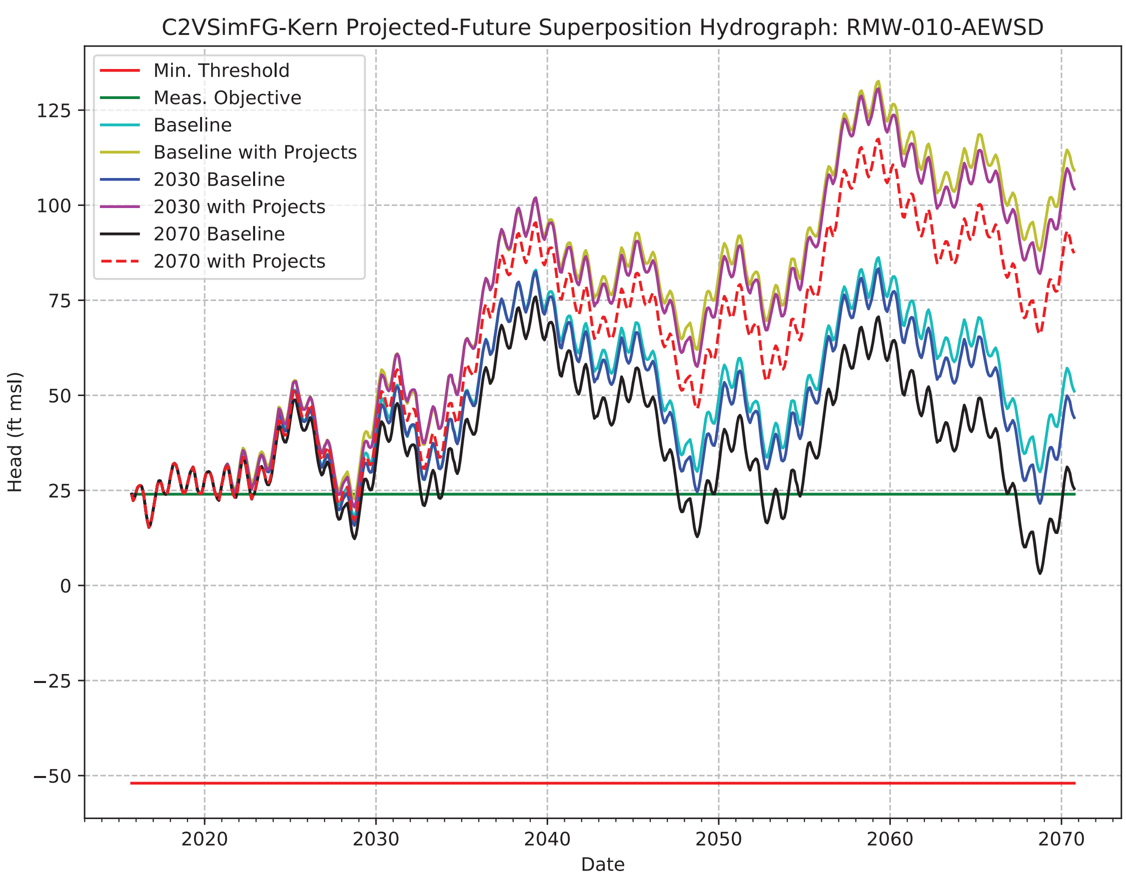
2070
Date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Meas. Objective
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2070 with Projects
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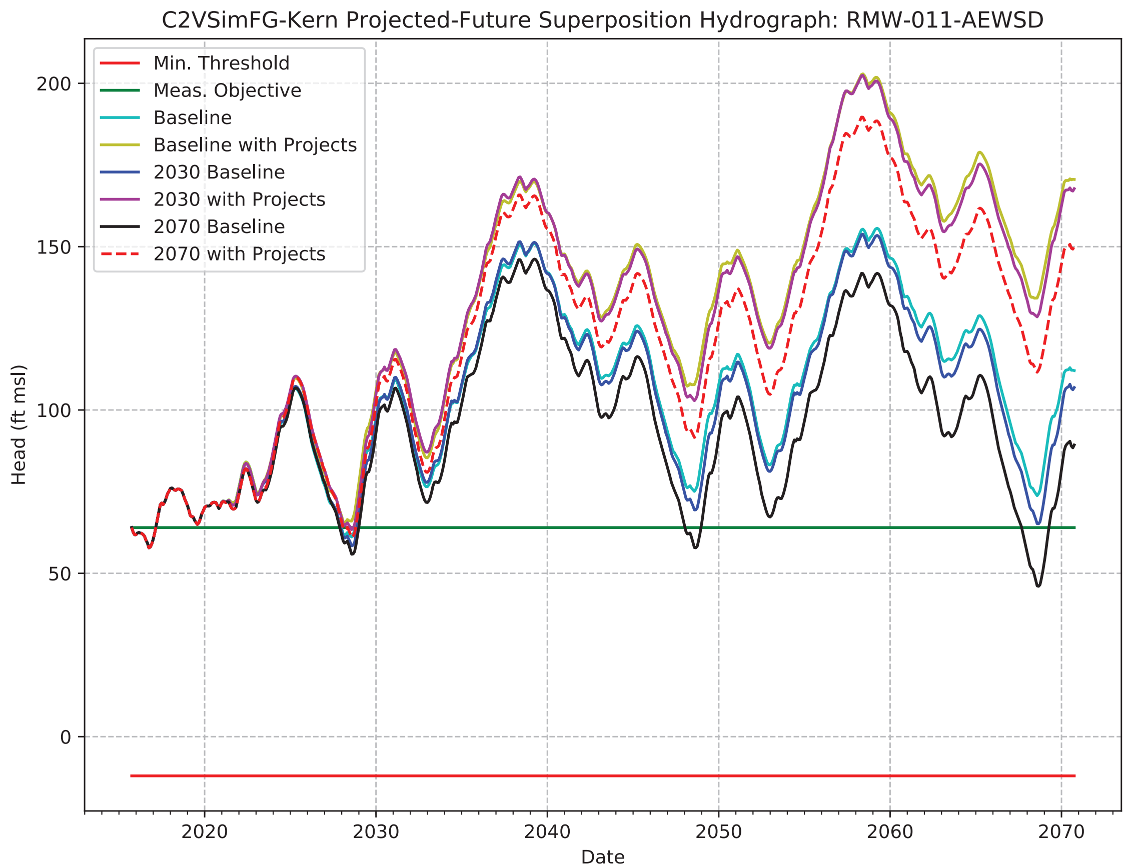
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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
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Head (ft msl)
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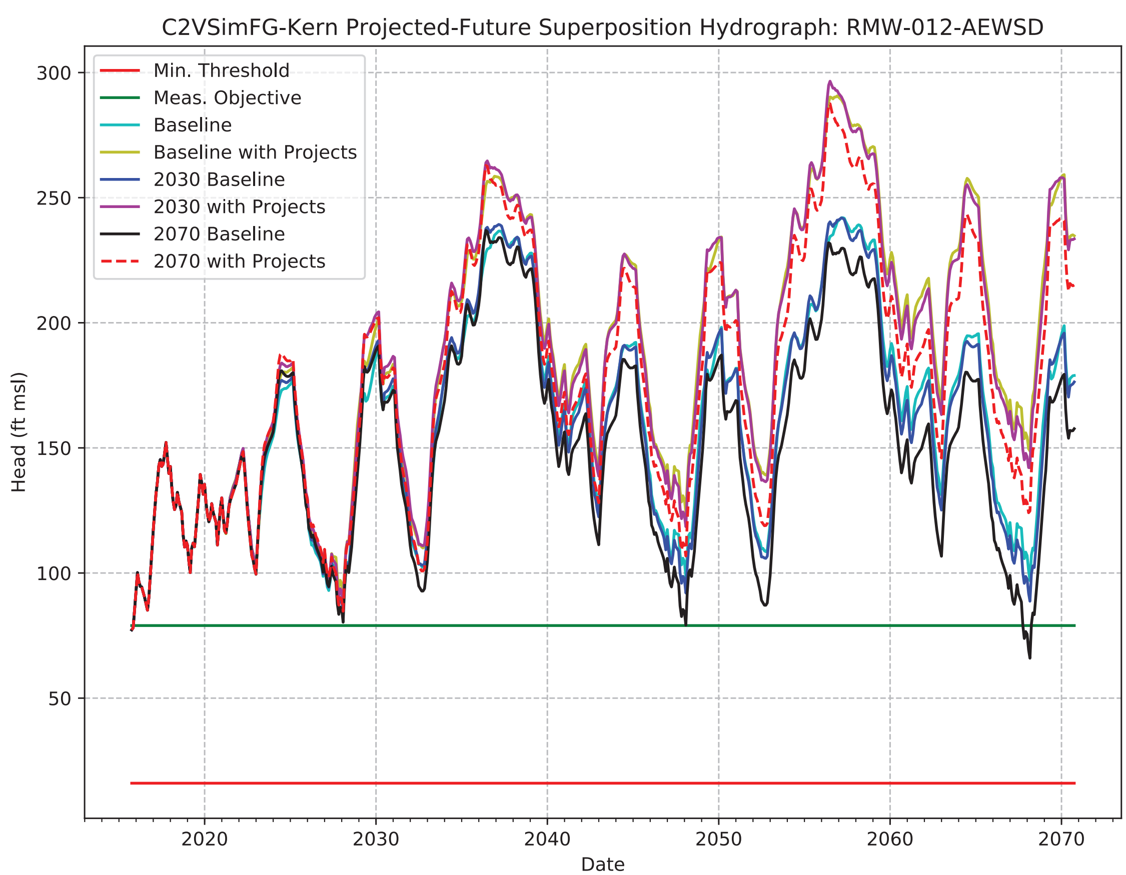
Date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Min. Threshold
Meas. Objective
Baseline
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2030 Baseline
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2070 with Projects
Head (ft msl)
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200
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100
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2020
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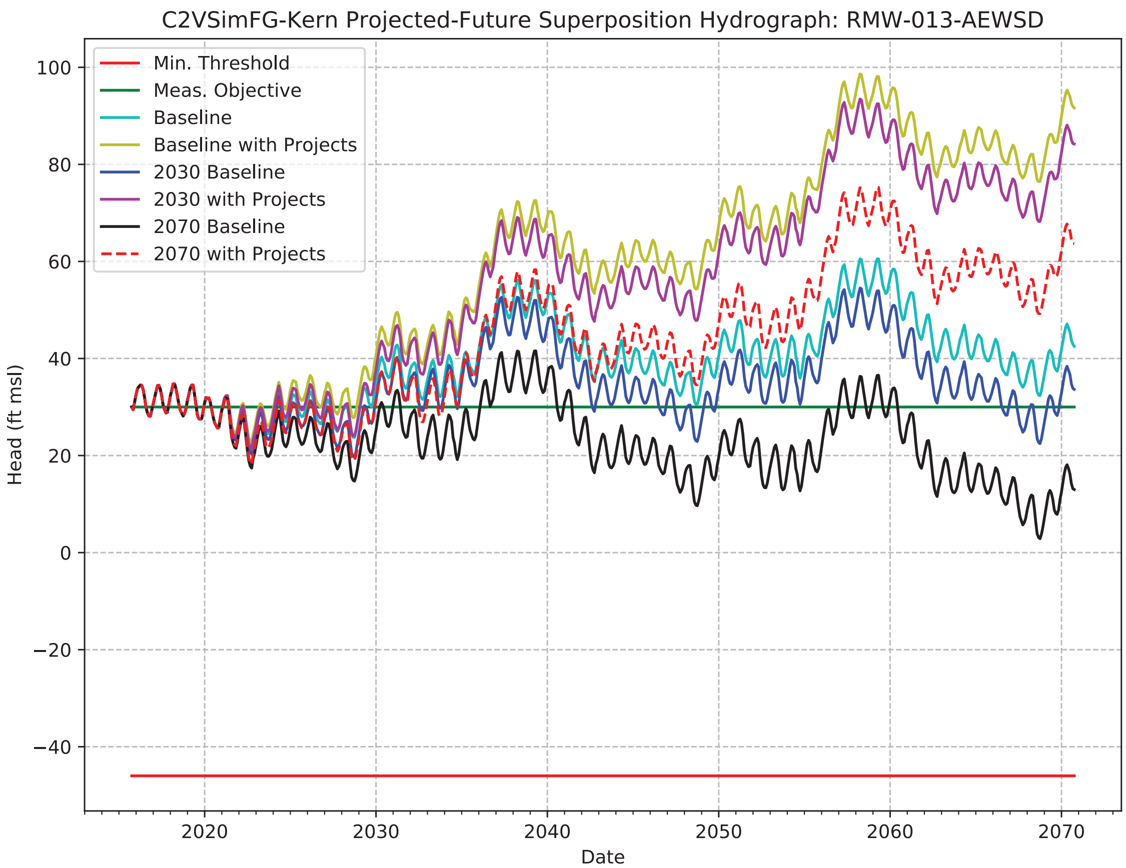
Date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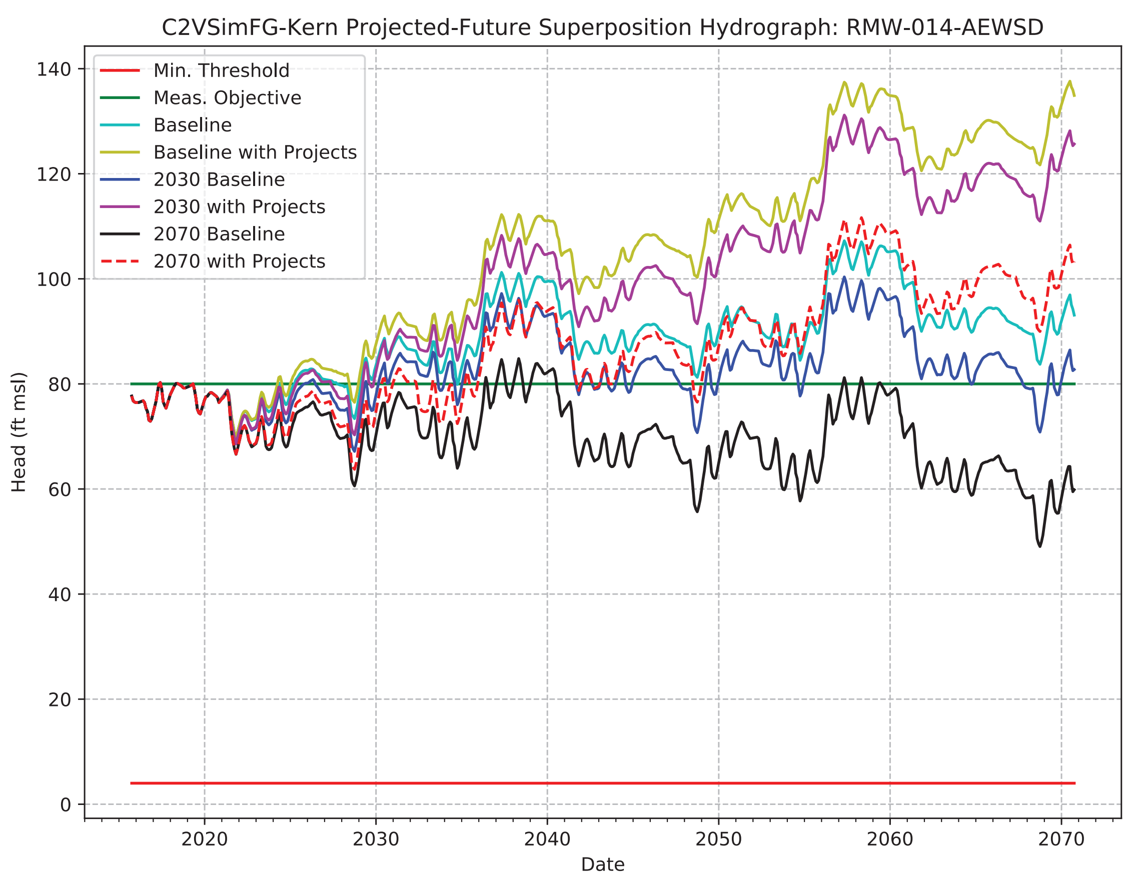
2070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Meas. Objective
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2070 with Projects
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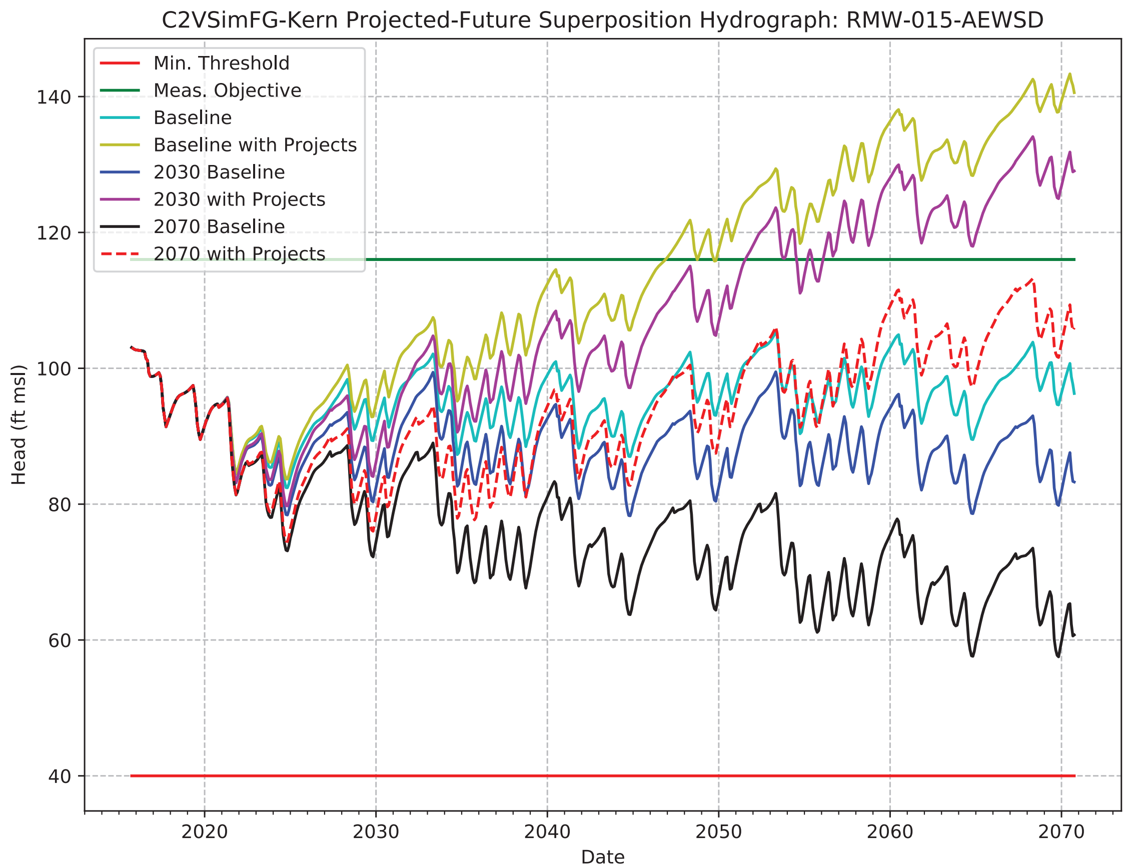
2060
2070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Meas. Objective
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Head (ft msl)
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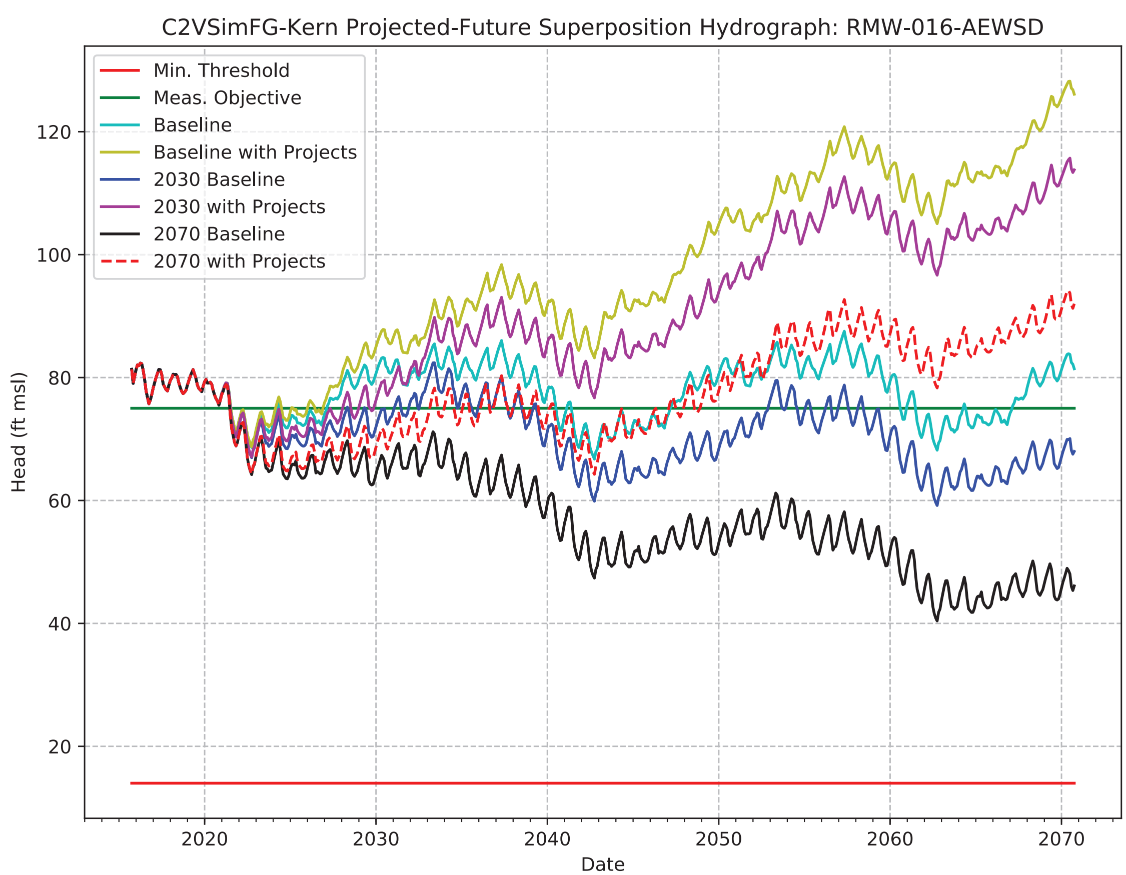
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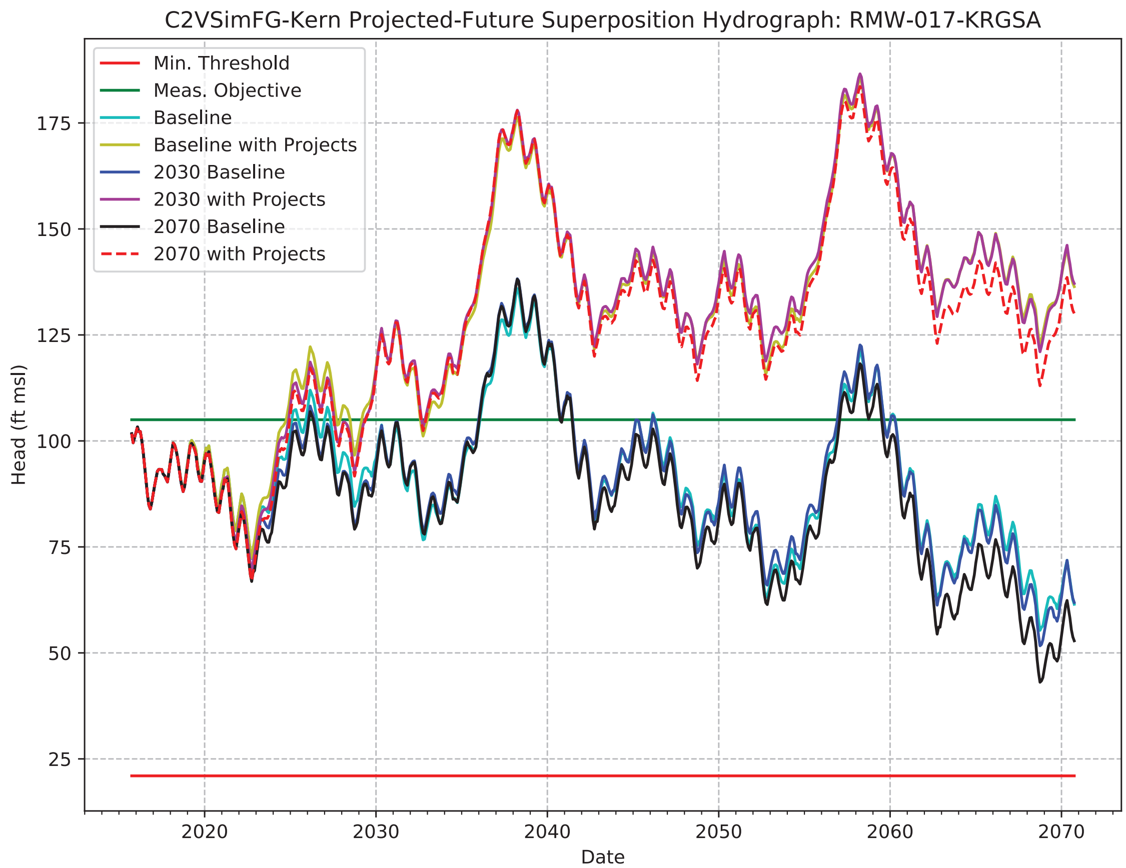
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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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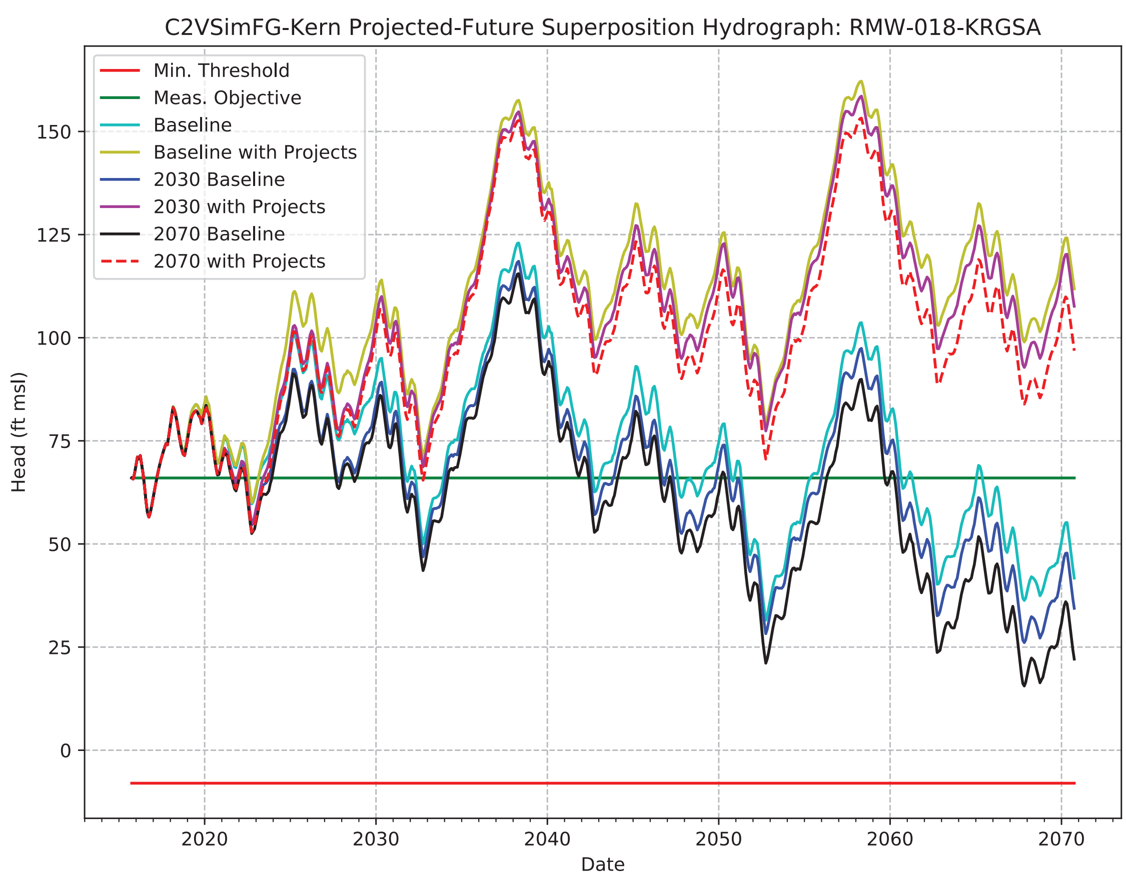
2050
2060
2070
Date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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
150
125
100
75
50
25
0
2020
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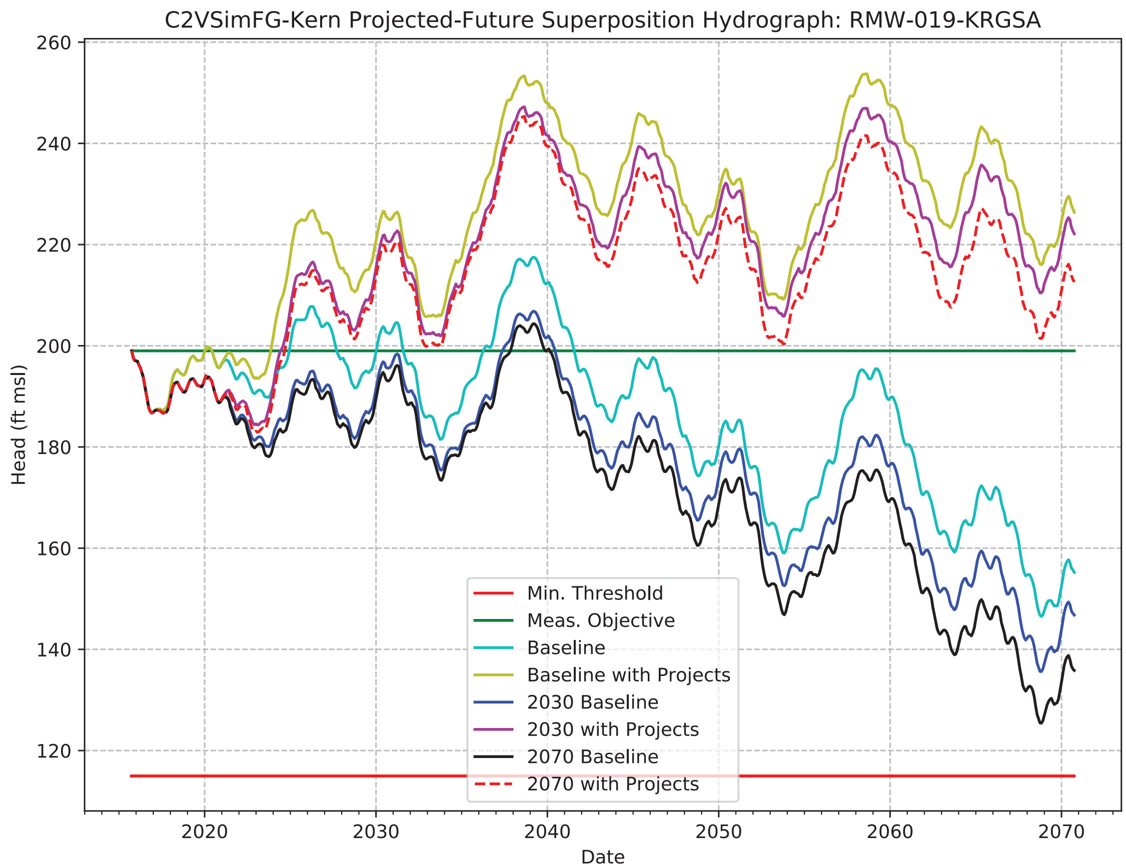
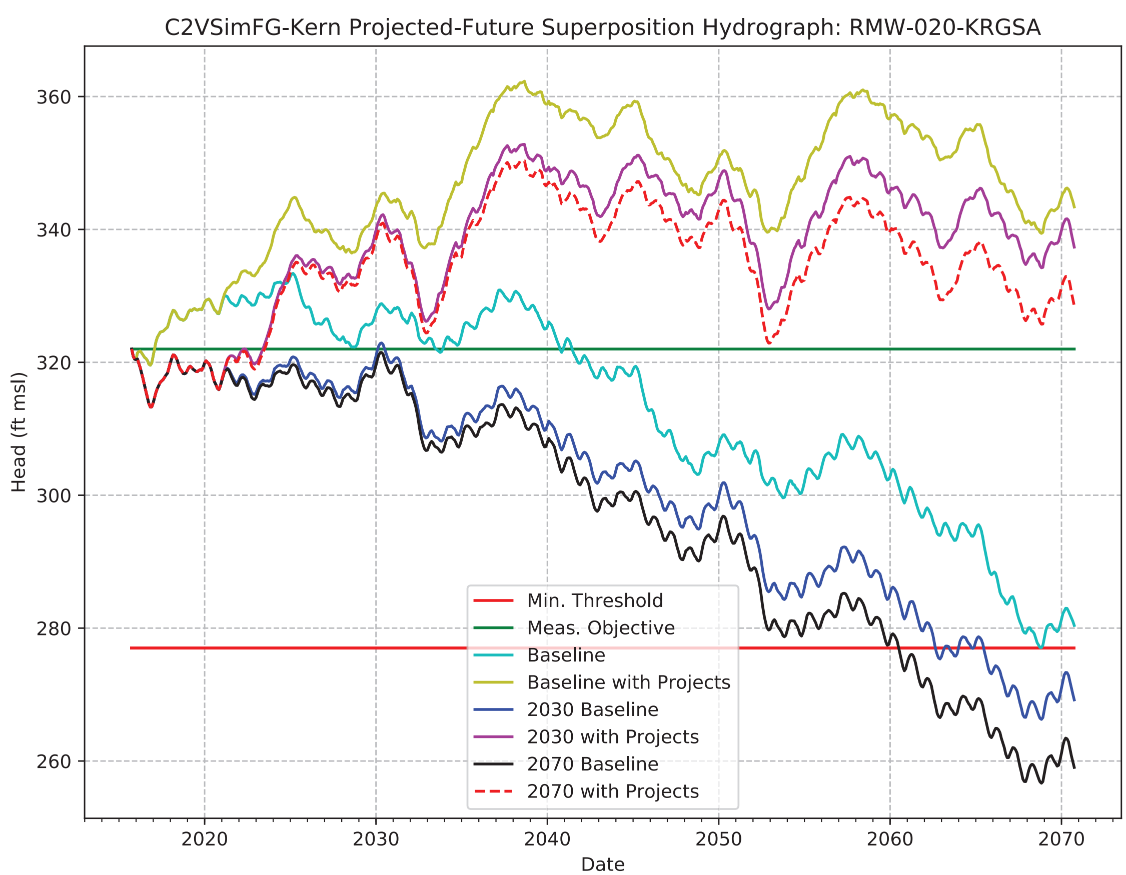
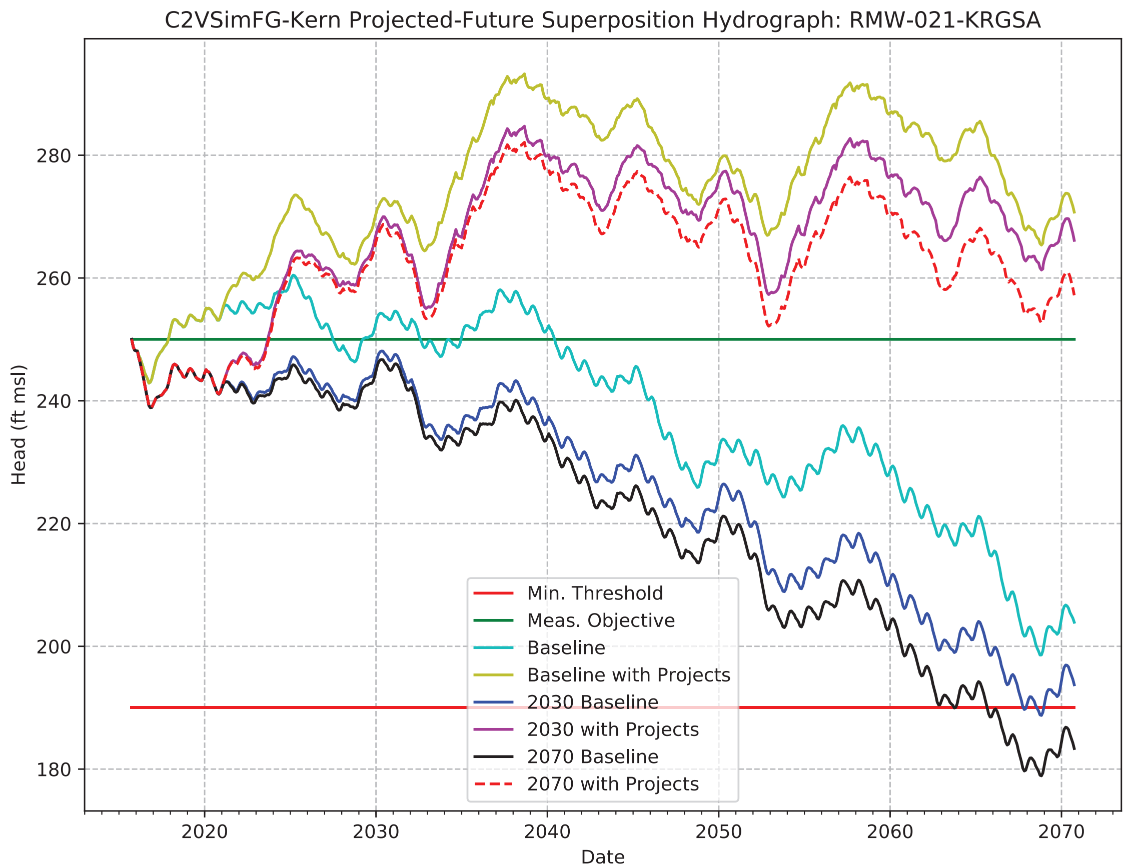
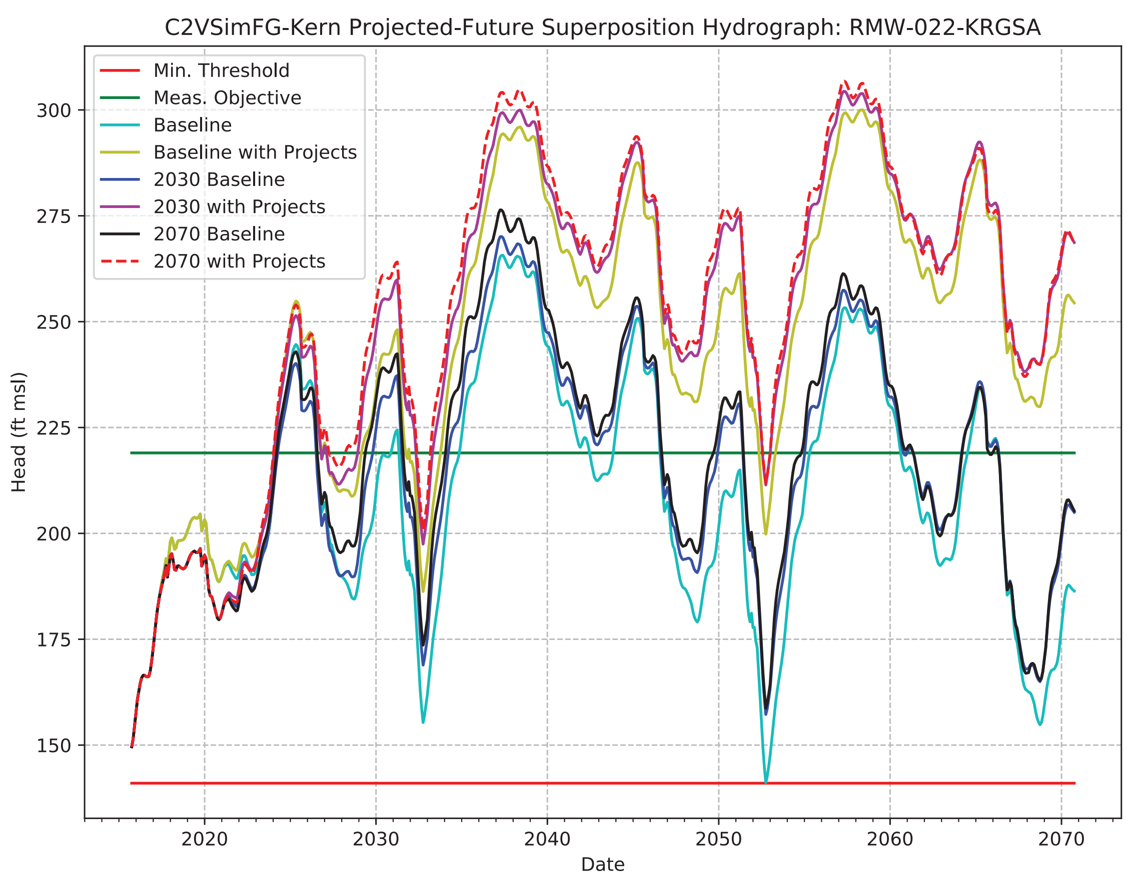
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-019-KRGSA
Head (ft msl)
Date
260
240
220
200
180
160
140
120
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-020-KRGSA
Head (ft msl)
Date
360
340
320
300
280
260
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-021-KRGSA
Head (ft msl)
Date
180
200
220
240
260
280
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects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Head (ft msl)
Date
150
175
200
225
250
275
300
2020
2030
2040
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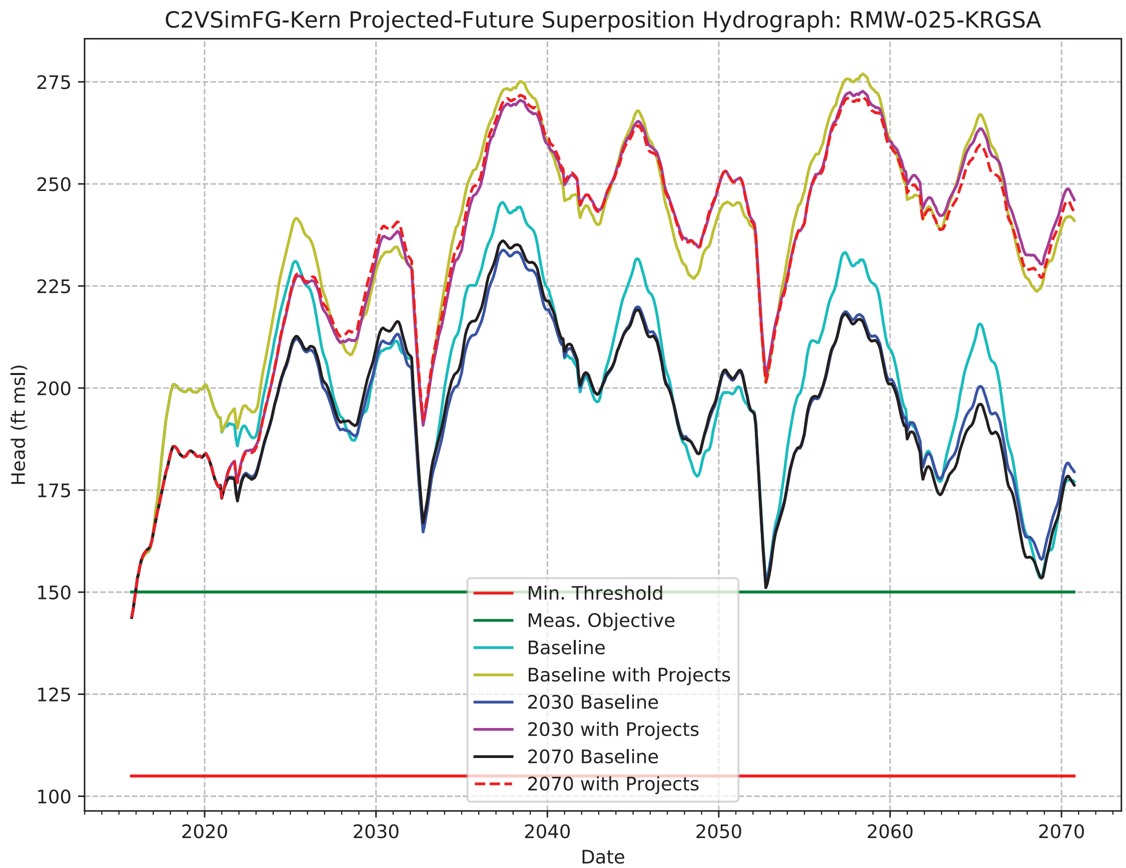
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects



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Date
Min. Threshold
Meas. Objective
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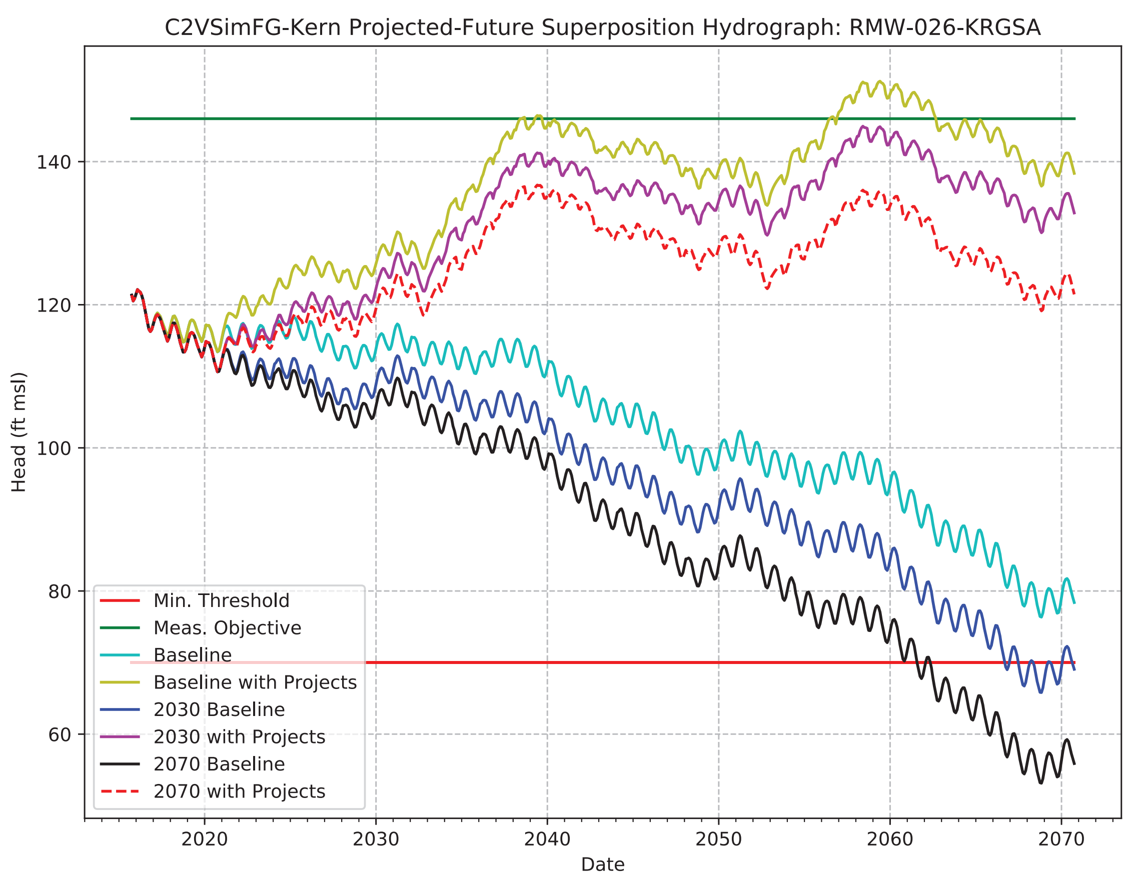
2070 with Projects

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Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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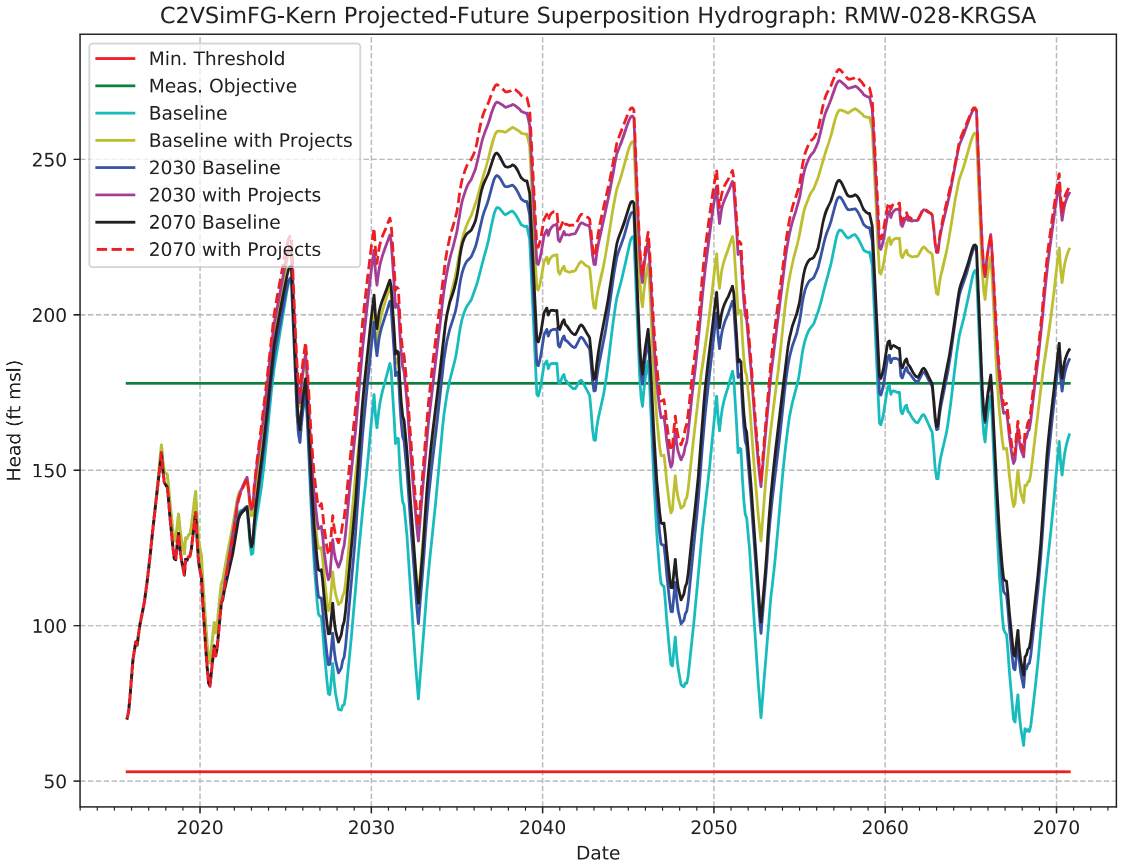
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-028-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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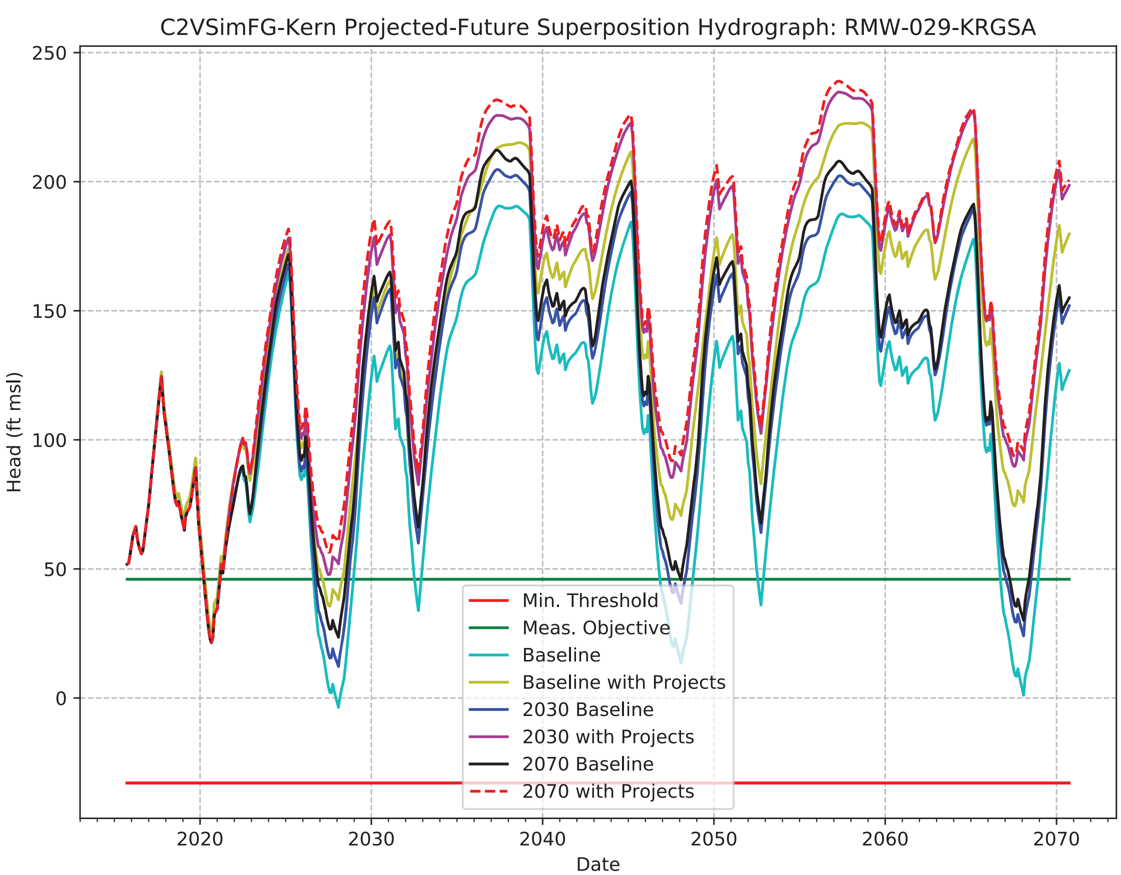
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-029-KRGSA
Head (ft msl)
0
50
100
150
200
250
Min. Threshold
Meas. Objective
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2030 Baseline
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2070 with Projects
2020
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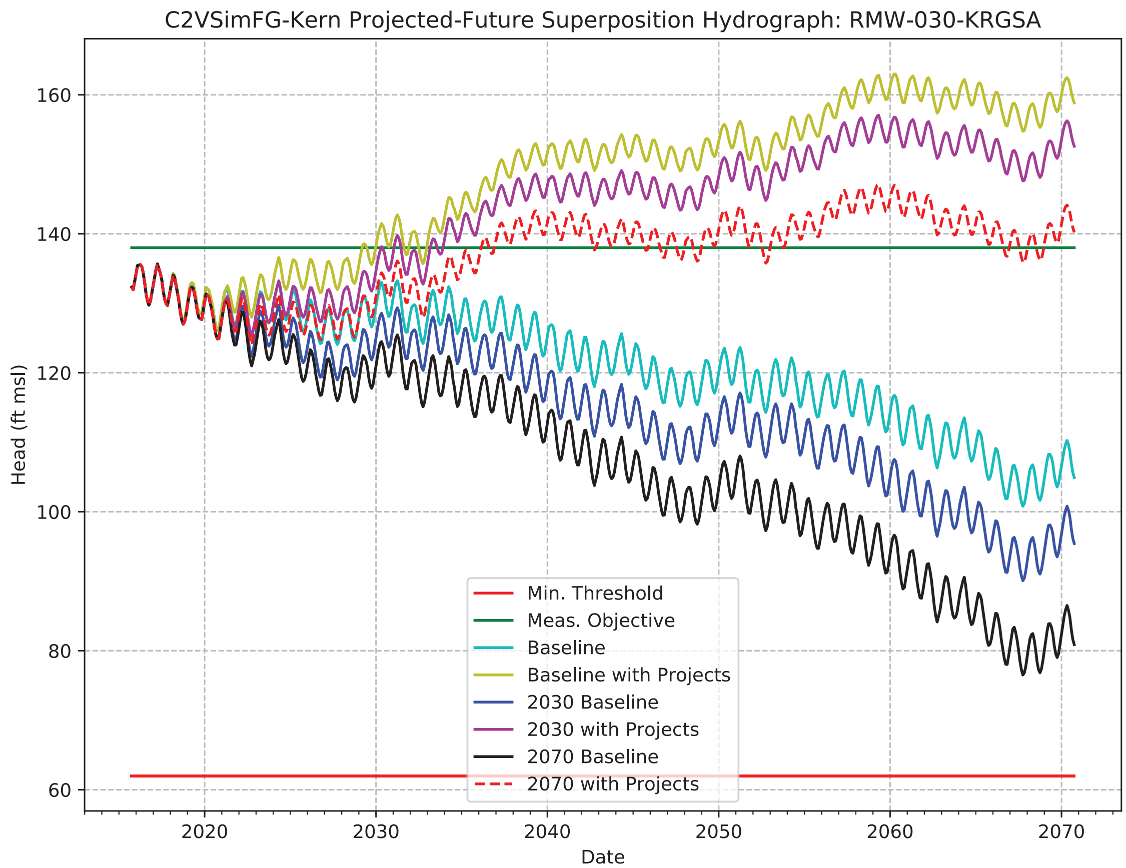
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-030-KRGSA
Head (ft msl)
Date
160
140
120
100
80
60
2020
2030
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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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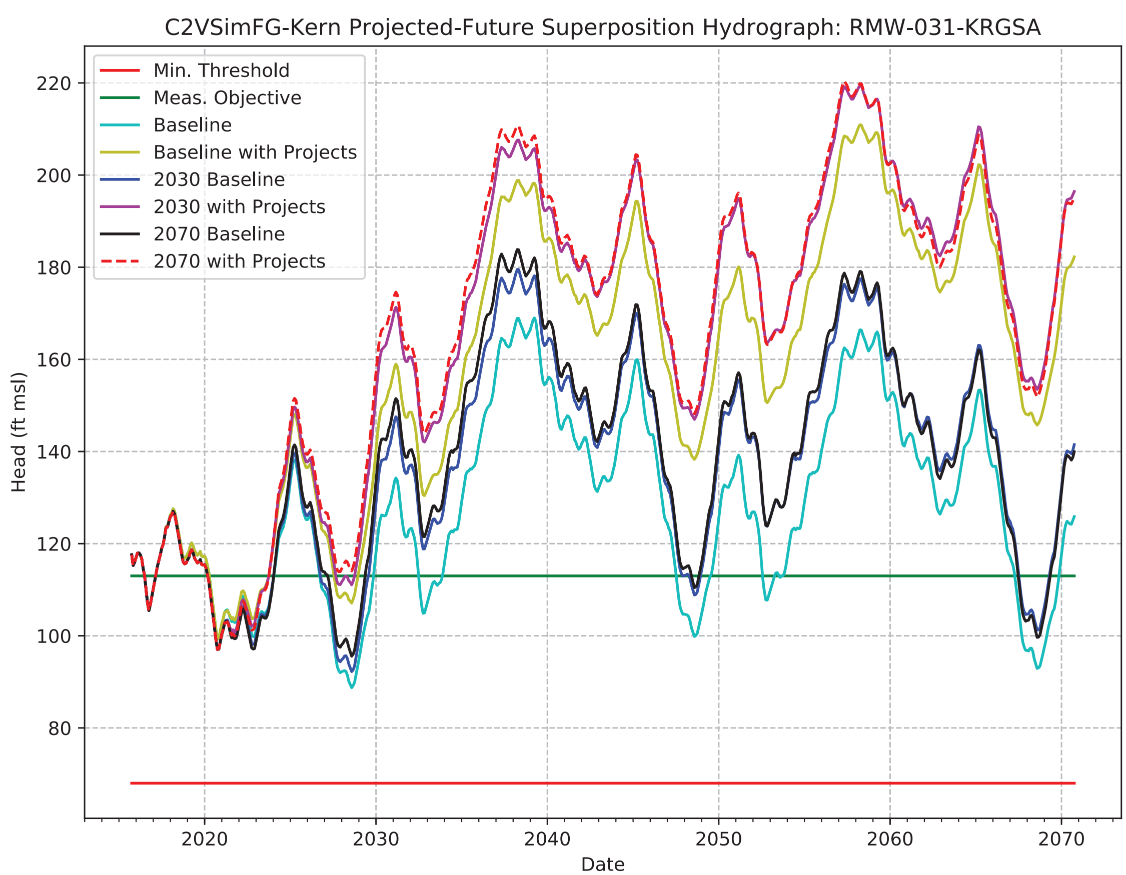
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-031-KRGSA
Head (ft msl)
Date
220
200
180
160
140
120
100
80
2020
2030
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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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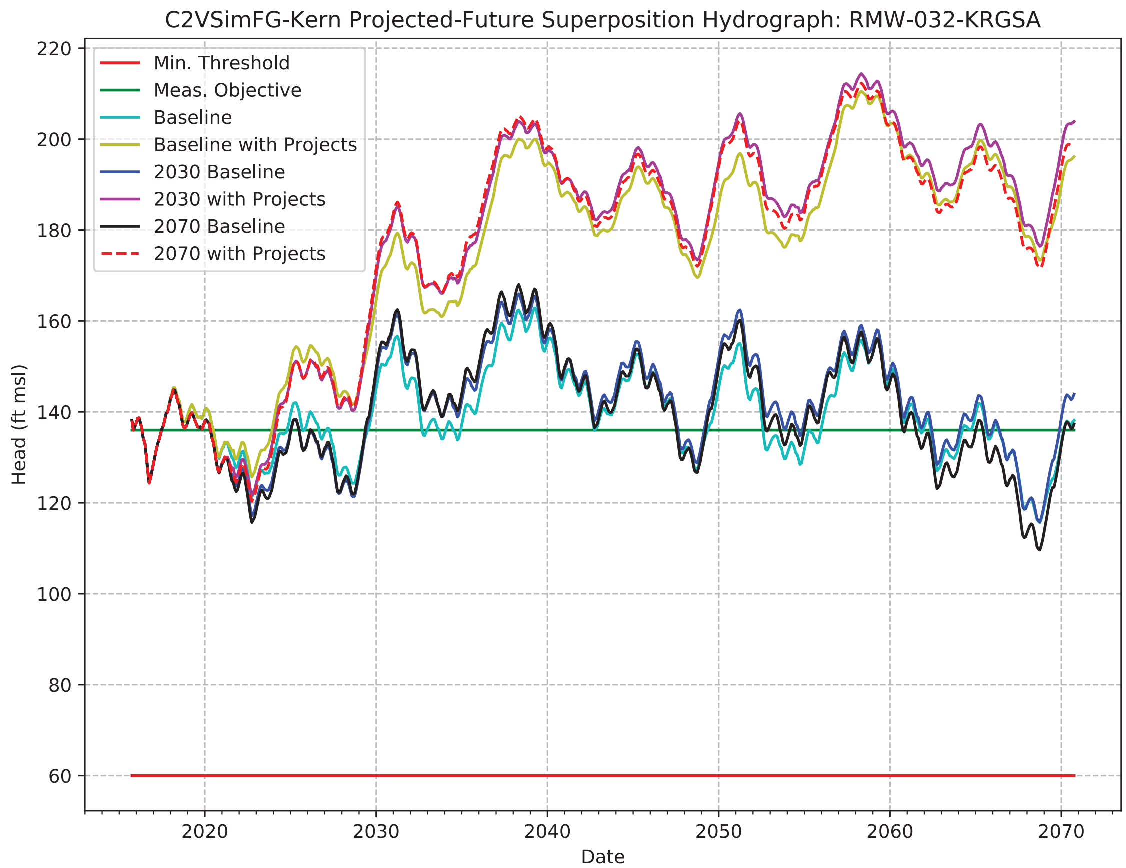
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-032-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
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200
180
160
140
120
100
80
60
2020
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2060
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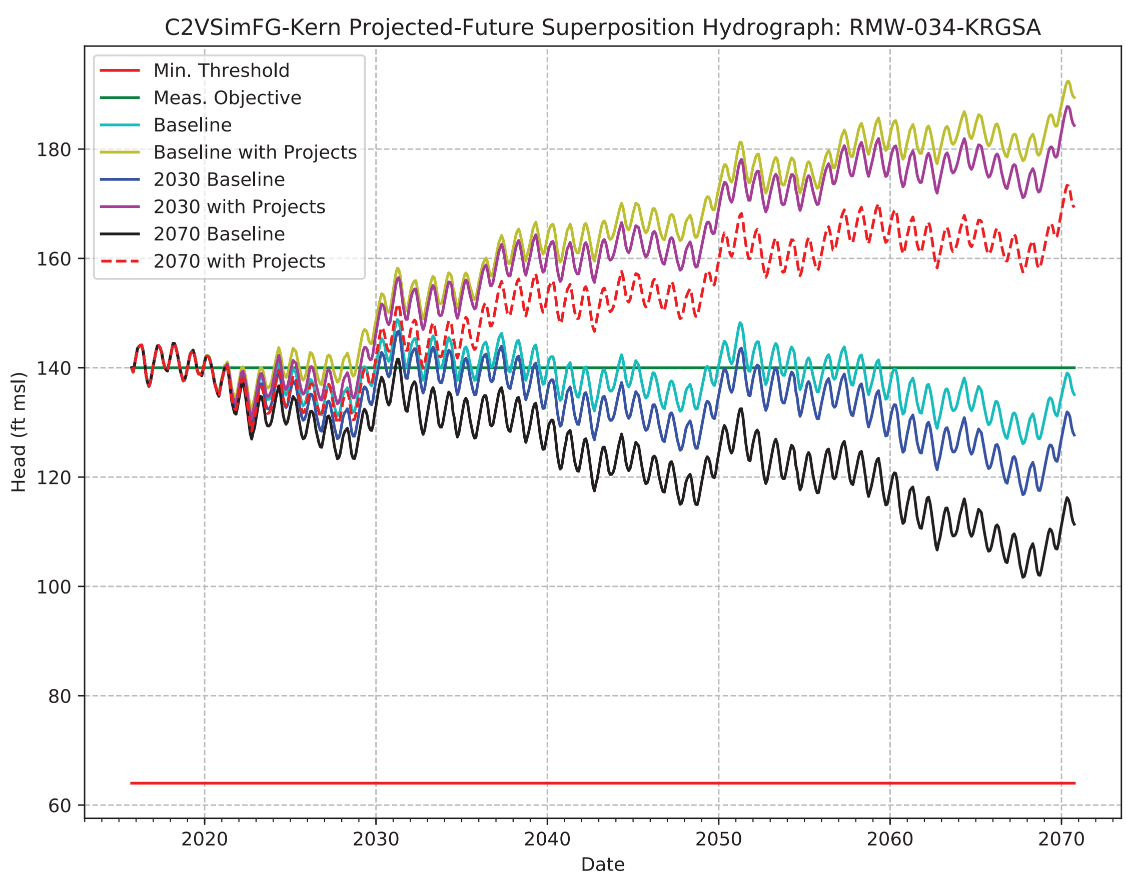
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-034-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
180
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120
100
80
60
2020
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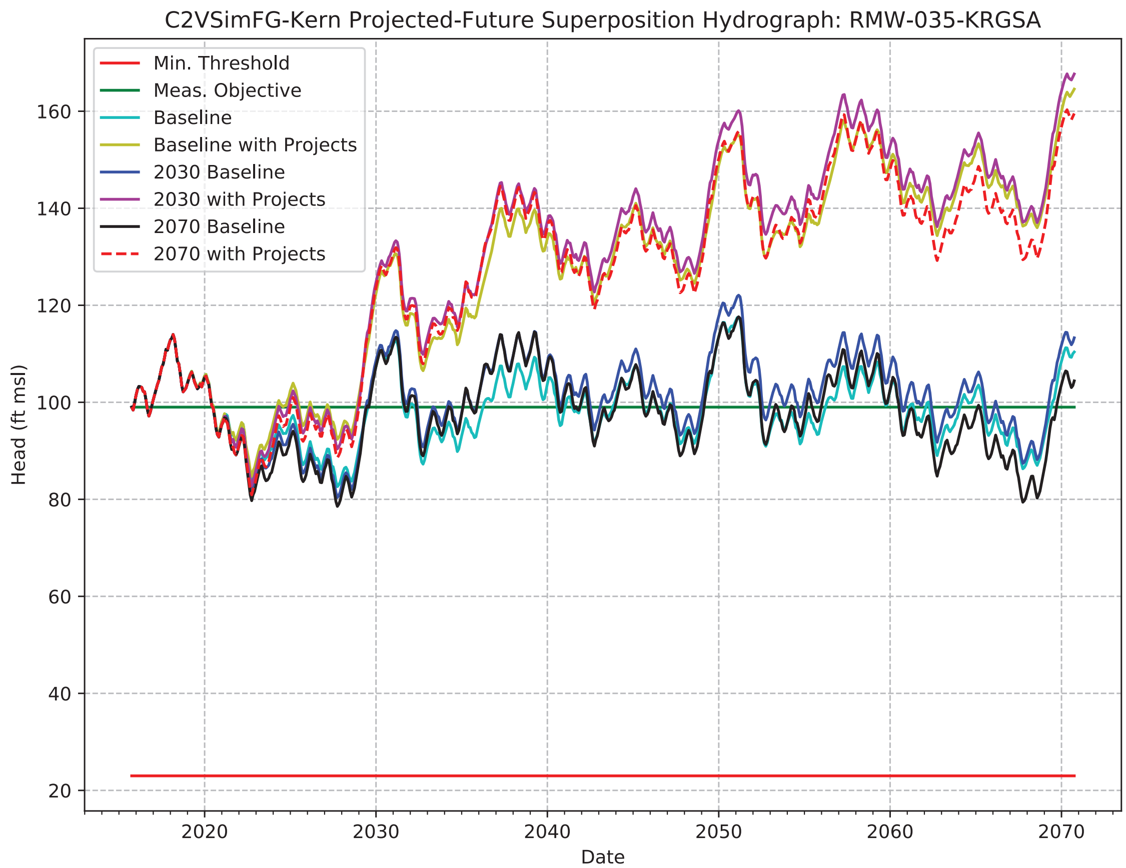
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-035-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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120
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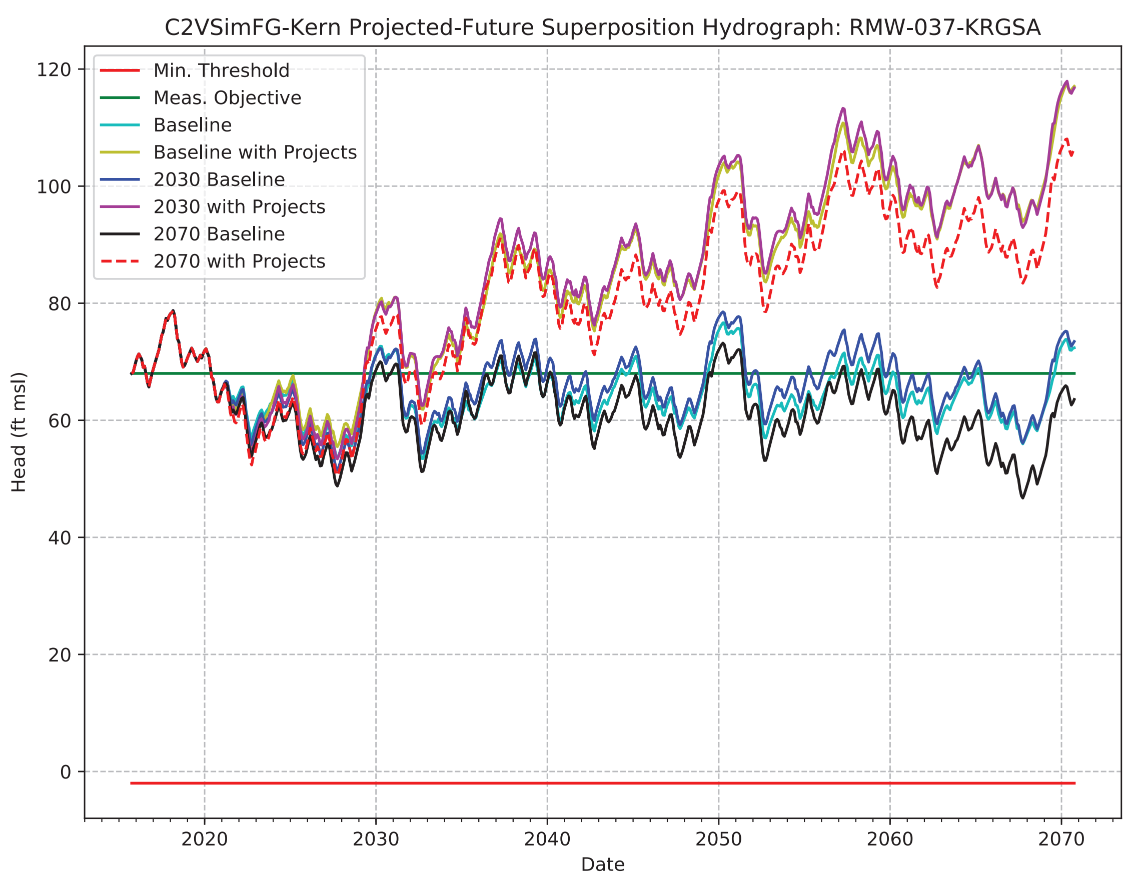
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-037-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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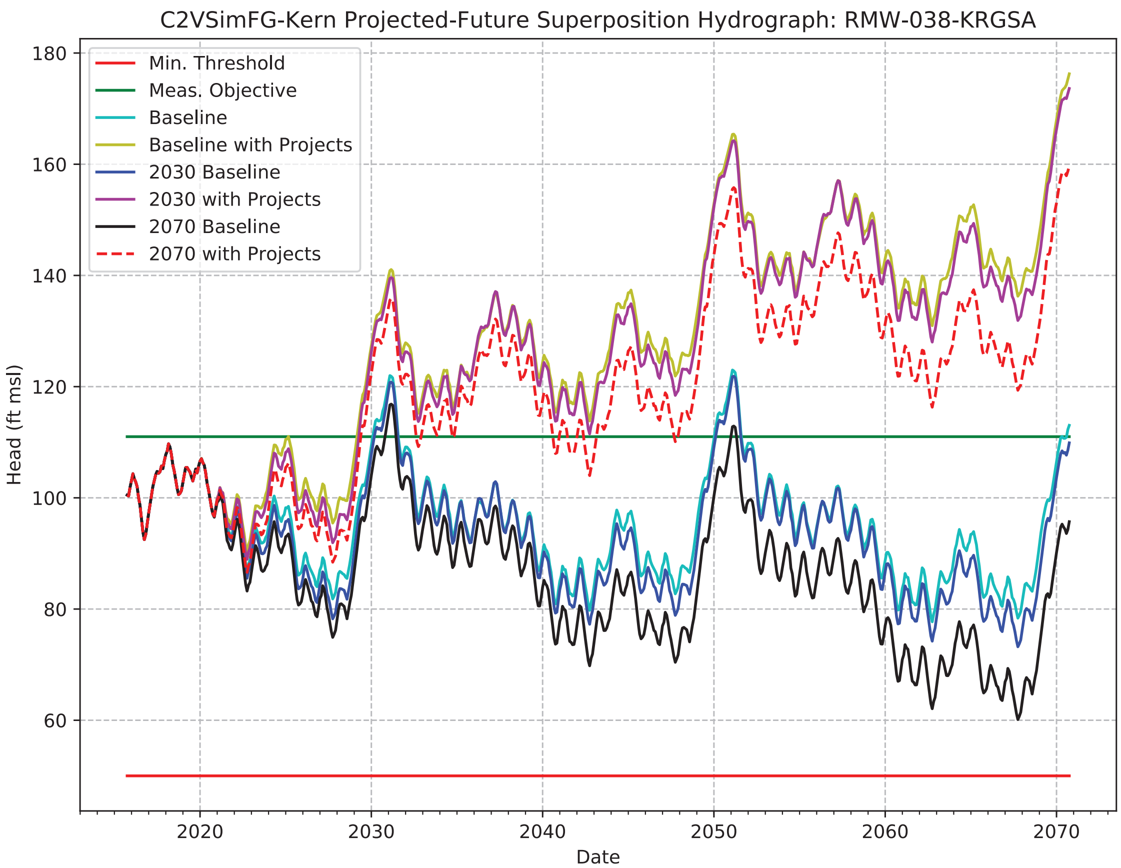
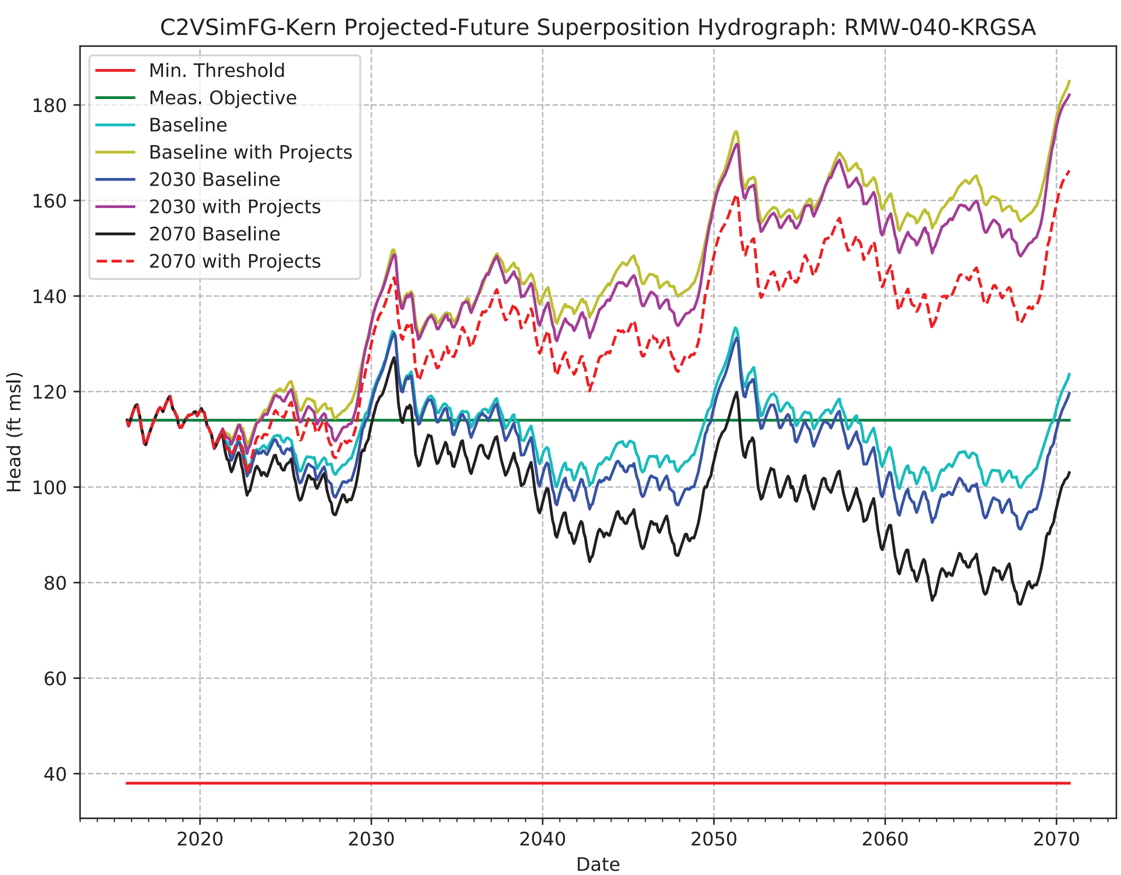
Date



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-038-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-040-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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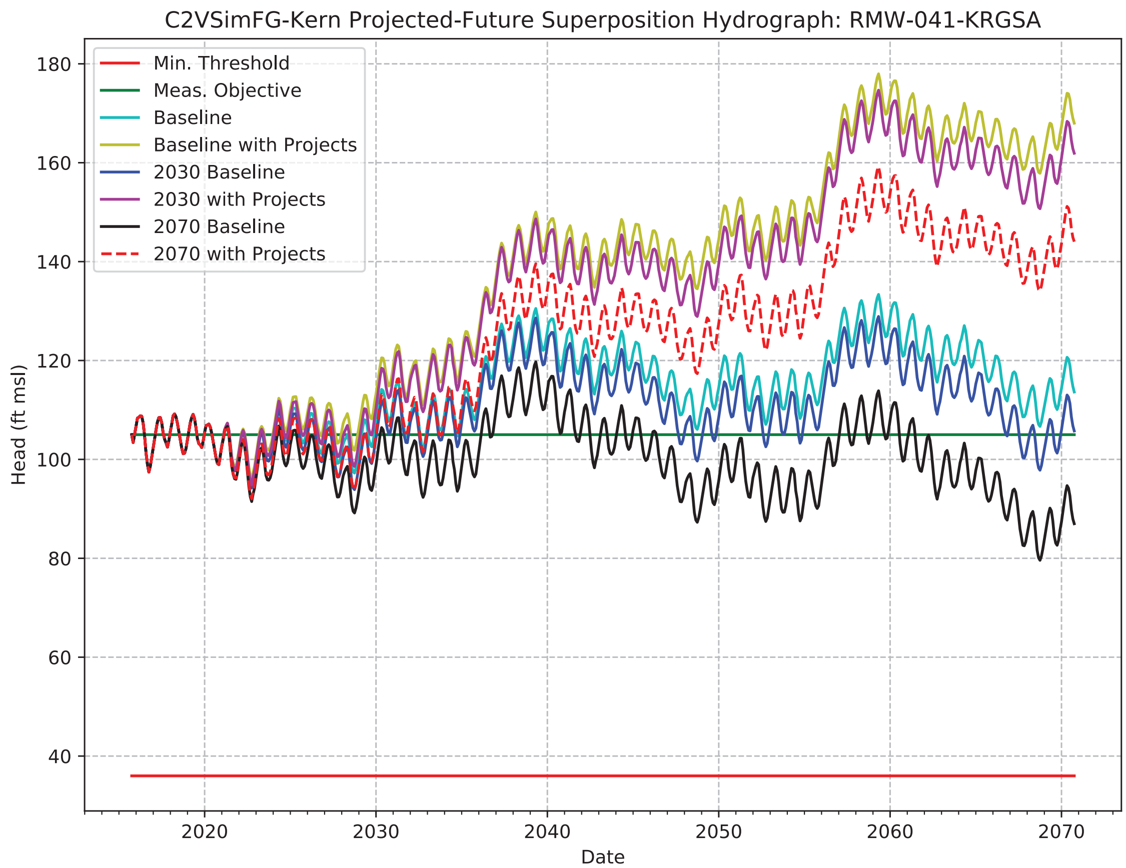
2070 with Projects
Head (ft msl)
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-041-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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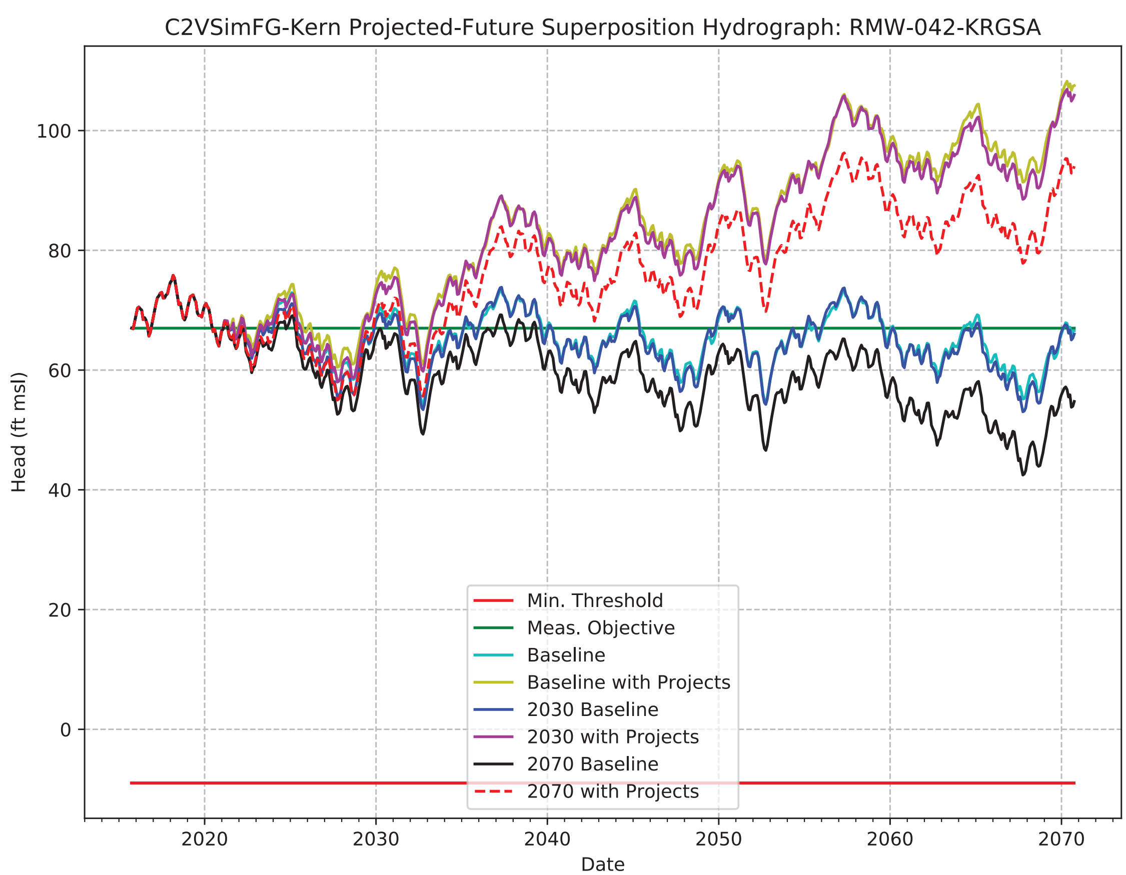
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-042-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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2030 with Projects
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Head (ft msl)
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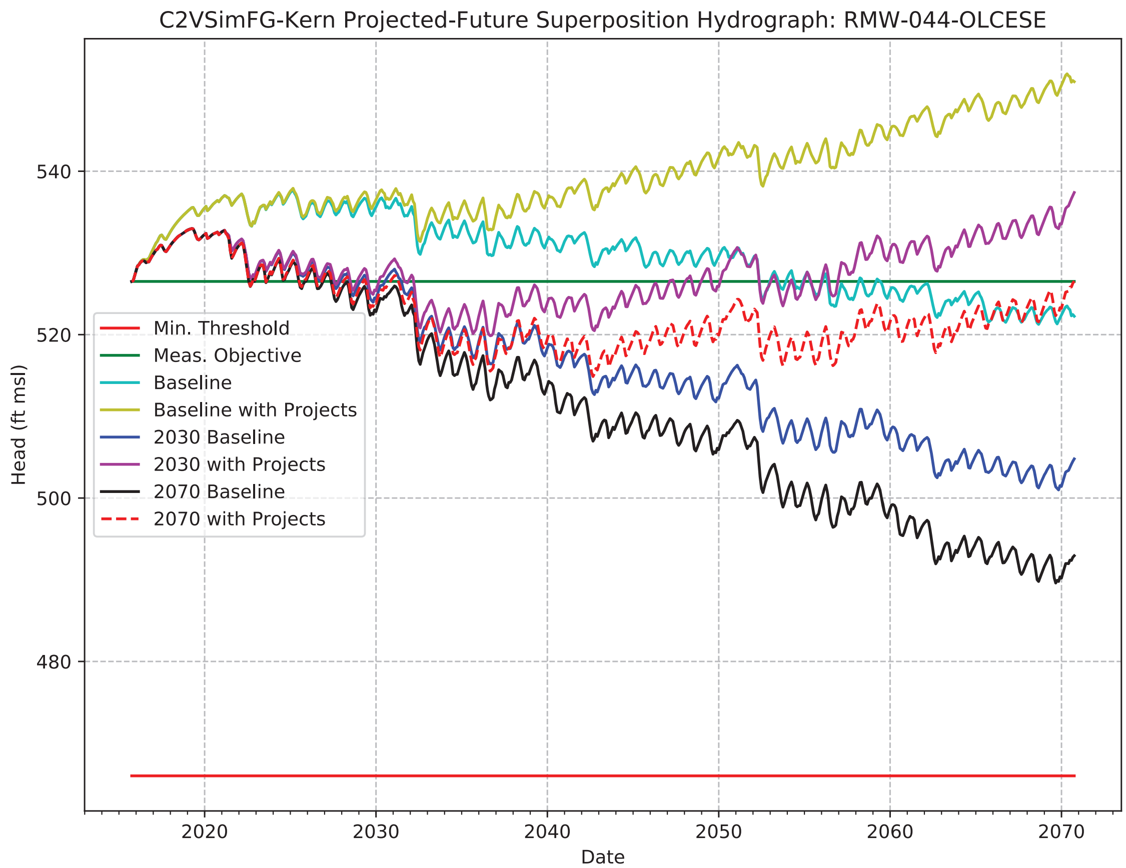
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-044-OLCESE
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
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Head (ft msl)
540
520
500
480
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2030
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2050
2060
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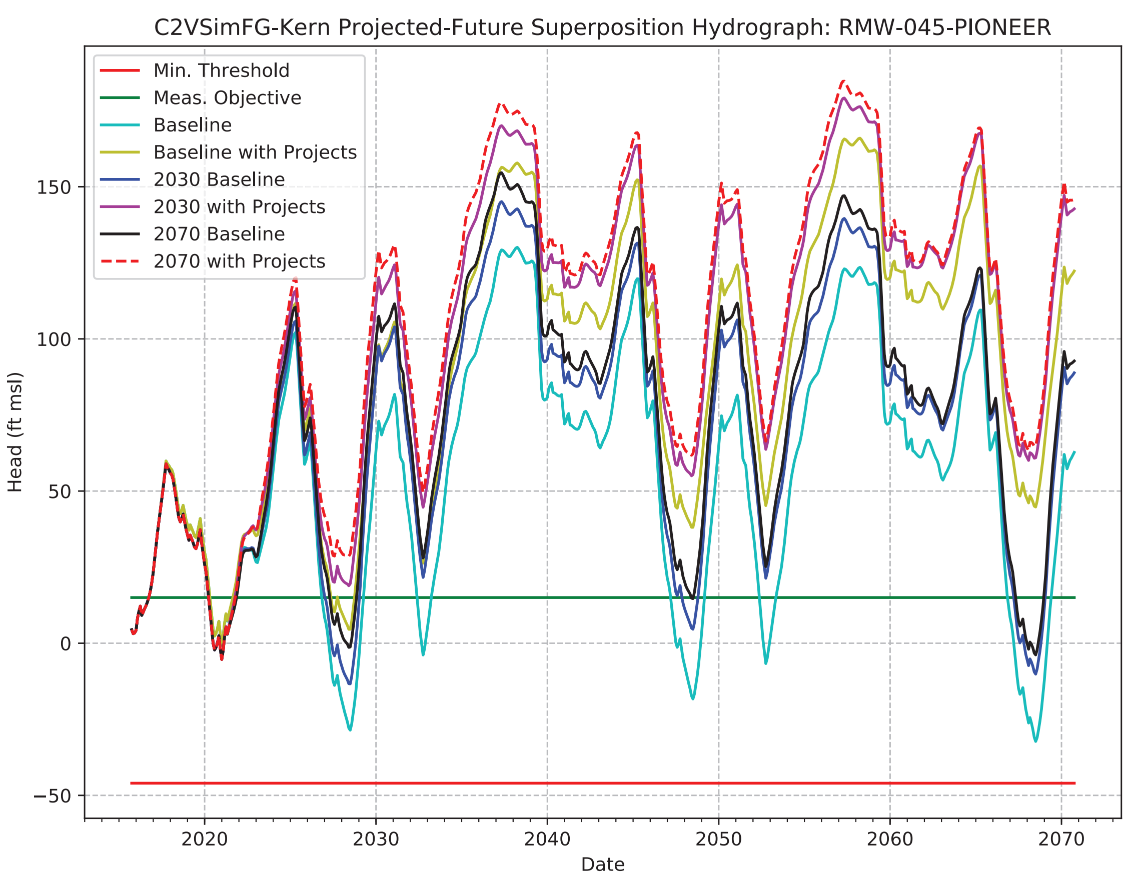
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-045-PIONEER
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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Head (ft msl)
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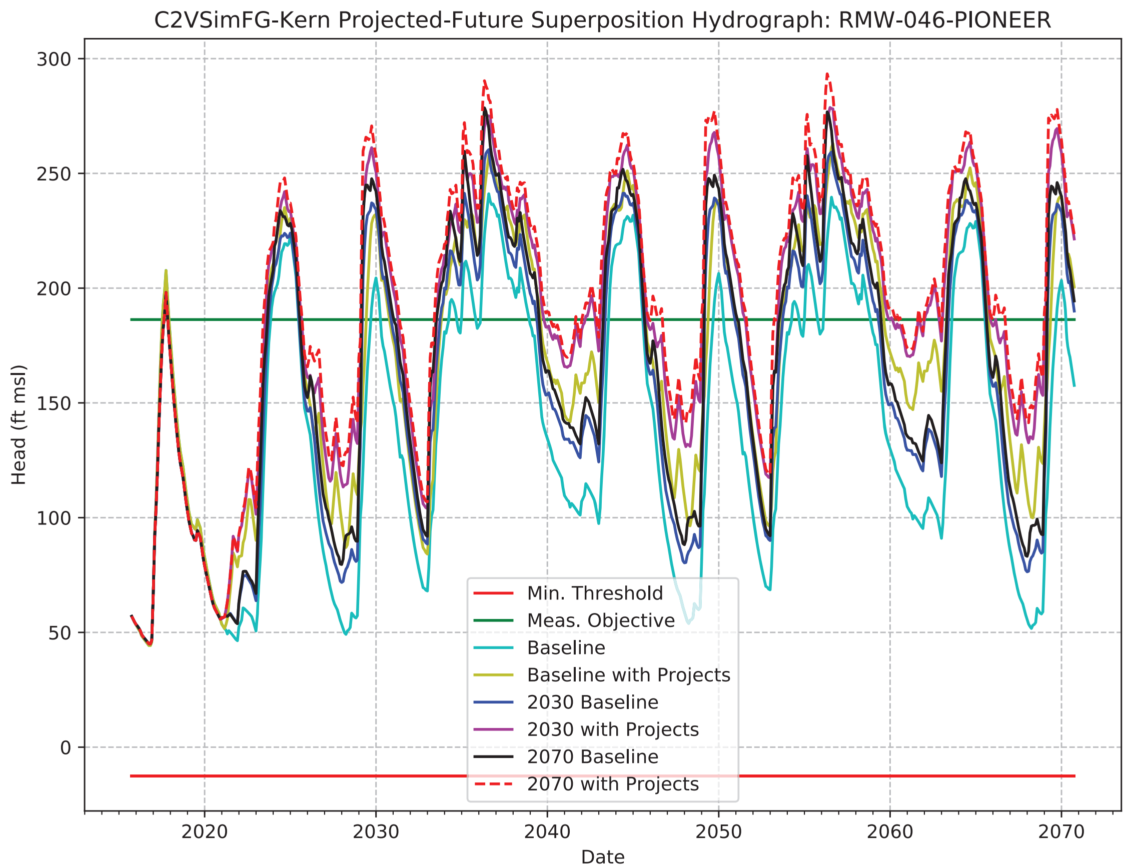
2060
2070
Date



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-046-PIONEER
Head (ft msl)
Date
300
250
200
150
100
50
0
2020
2030
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Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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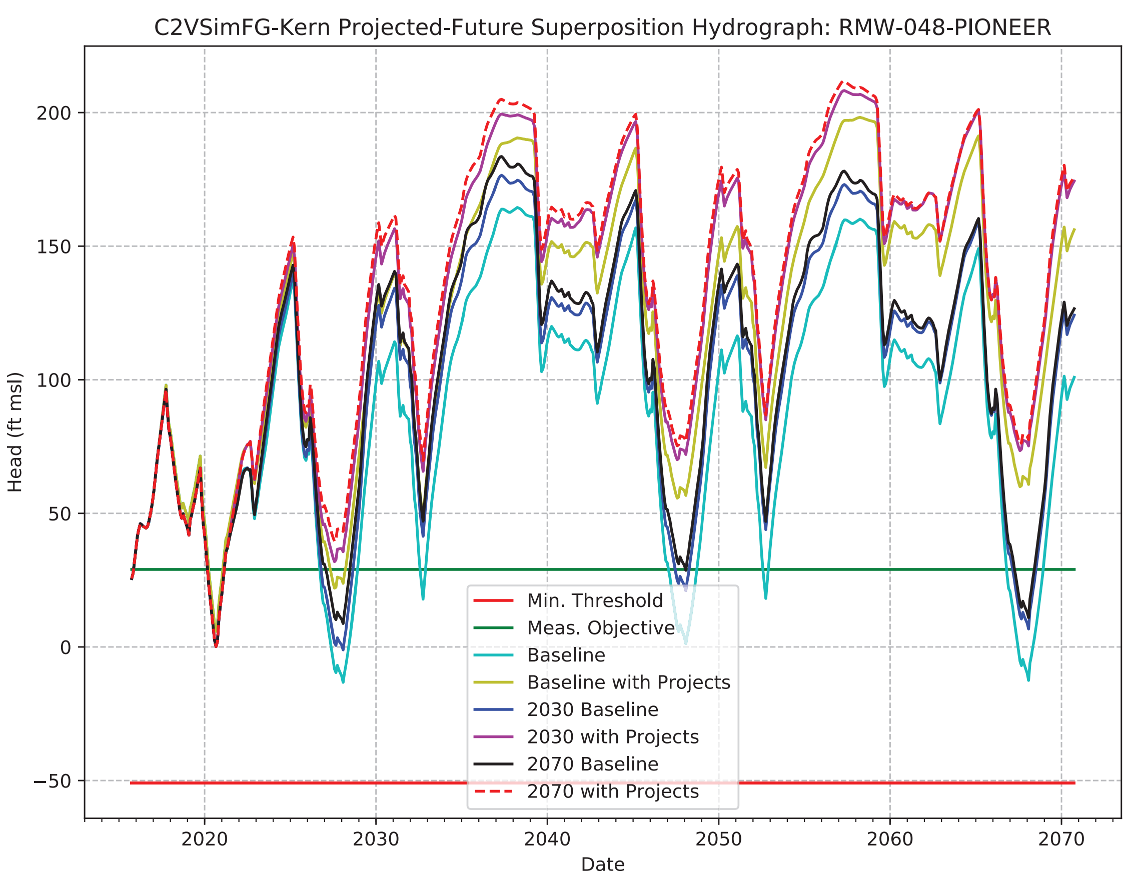
2030 with Projects
2070 Baseline
2070 with Projects

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-048-PIONEER
Head (ft msl)
Date
200
150
100
50
0
−50
2020
2030
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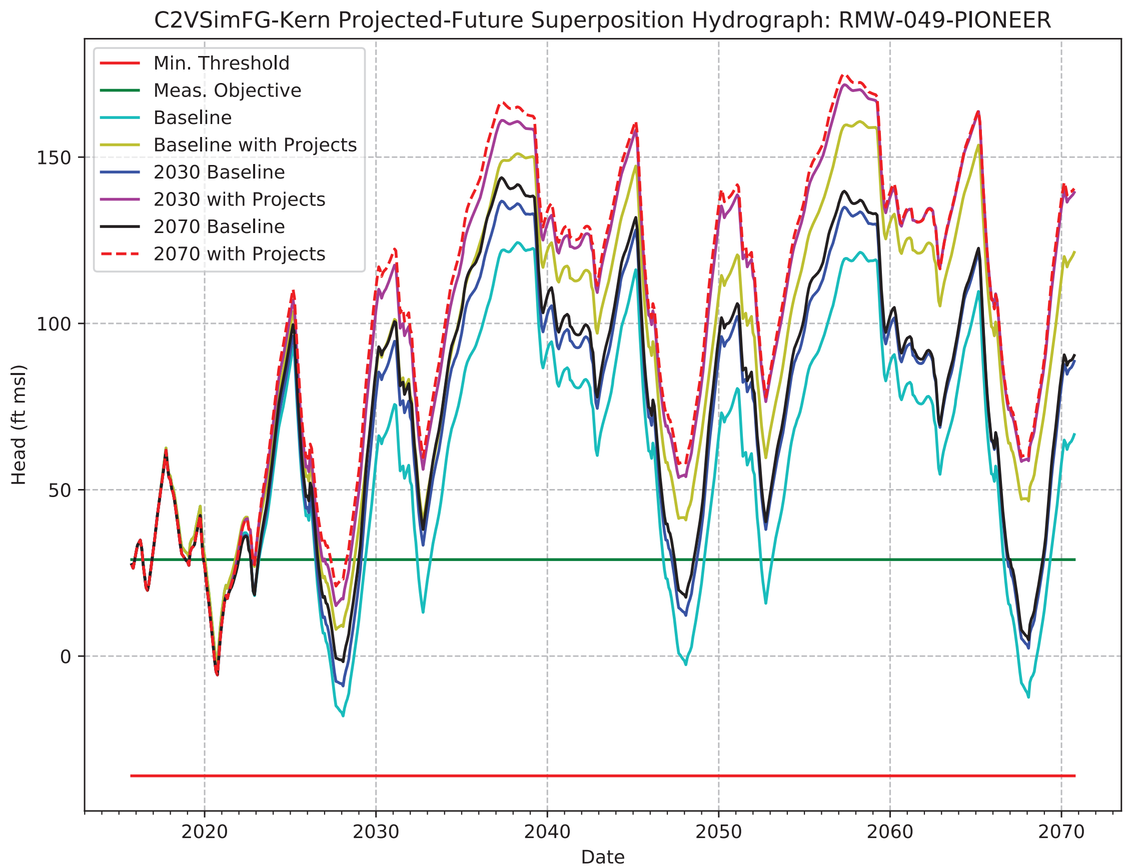
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-049-PIONEER
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
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Head (ft msl)
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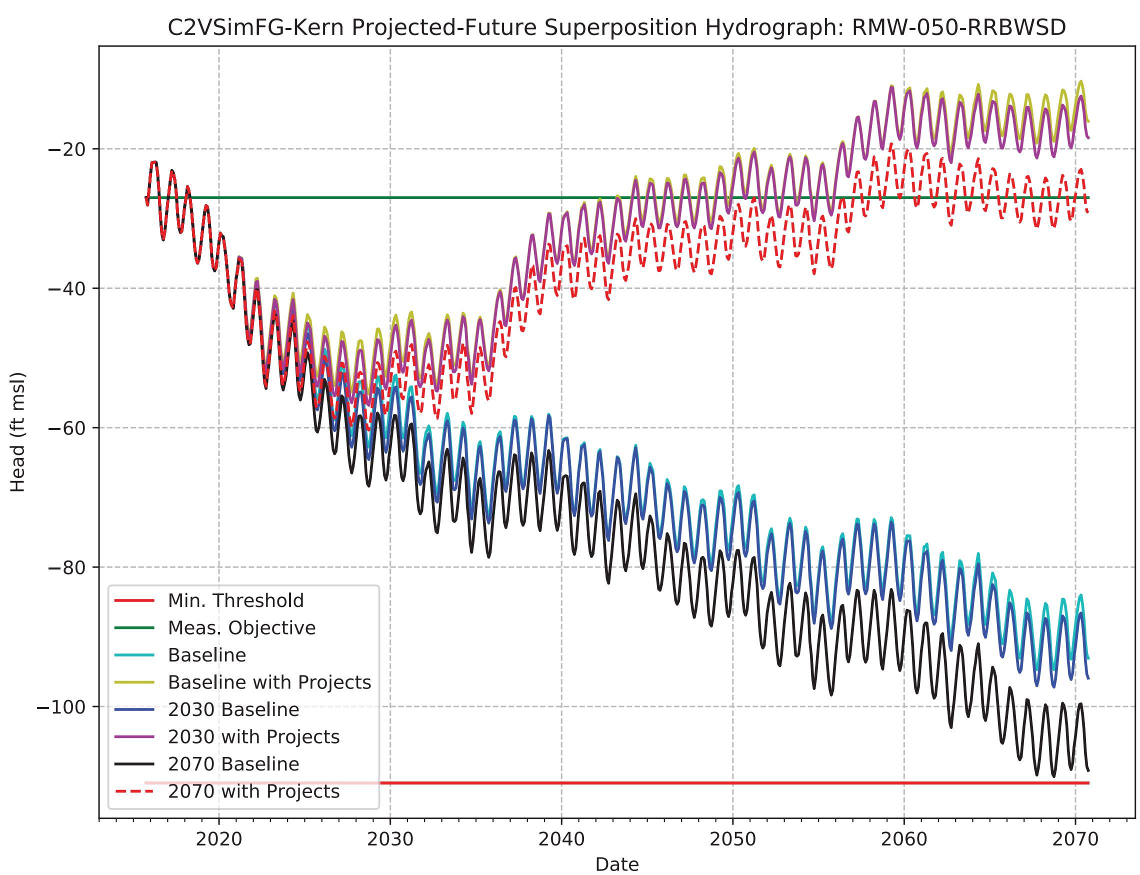
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-050-RRBWSD
Head (ft msl)
−20
−40
−60
−80
−100
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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2020
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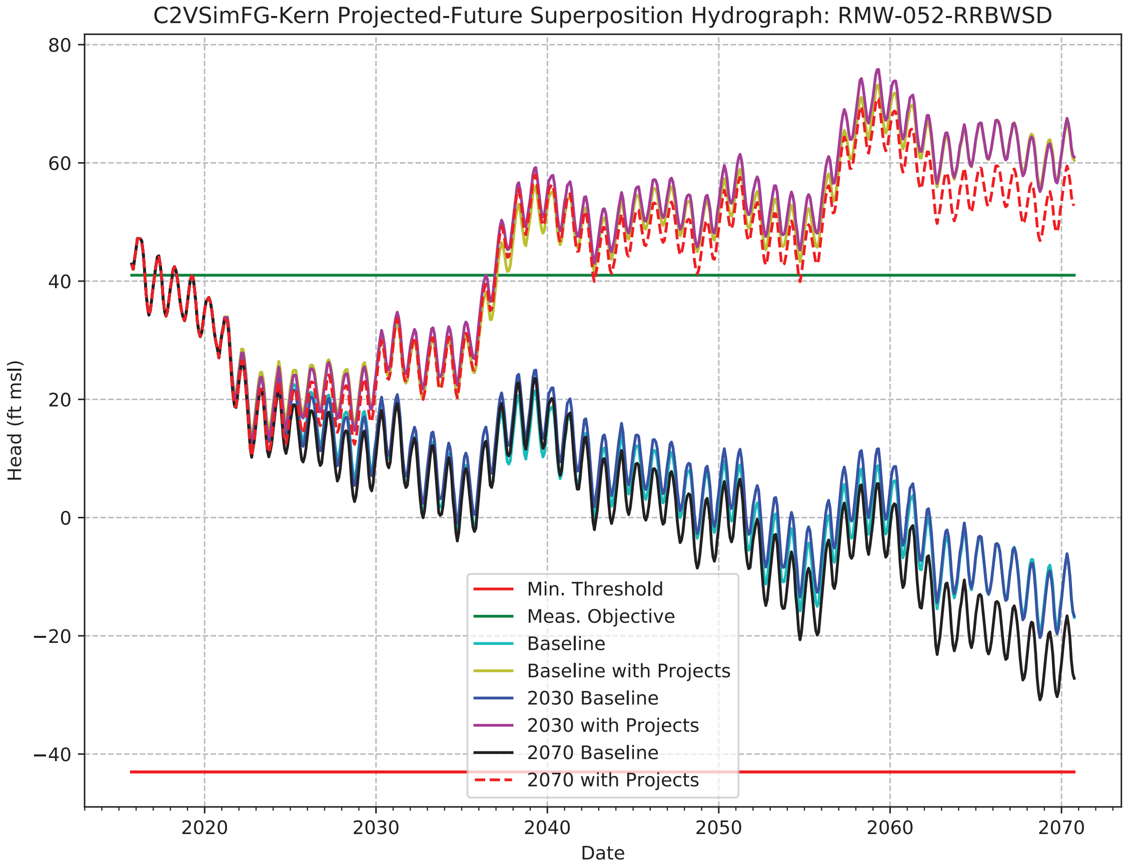
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-052-RRBWSD
Head (ft msl)
Date
80
60
40
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0
−20
−40
2020
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Min. Threshold
Meas. Objective
Baseline
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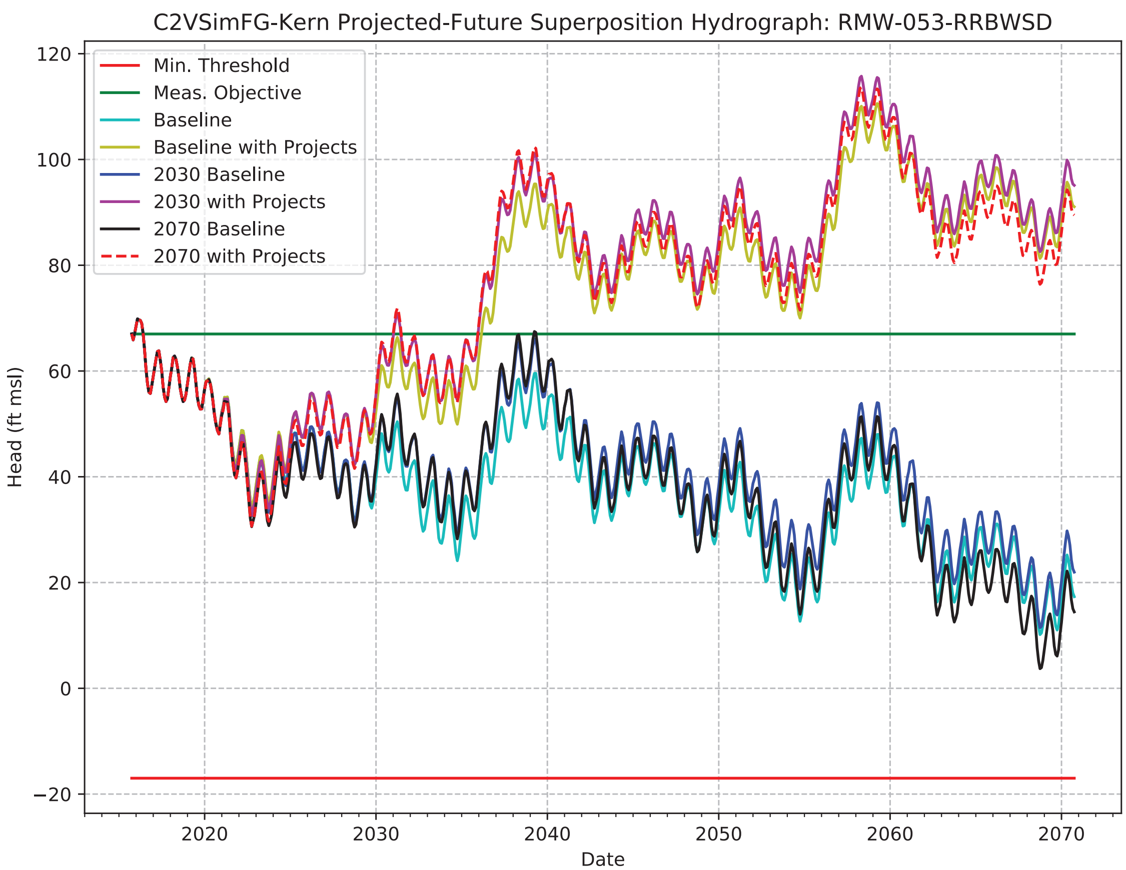
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-053-RRBWSD
Head (ft msl)
Date
120
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Min. Threshold
Meas. Objective
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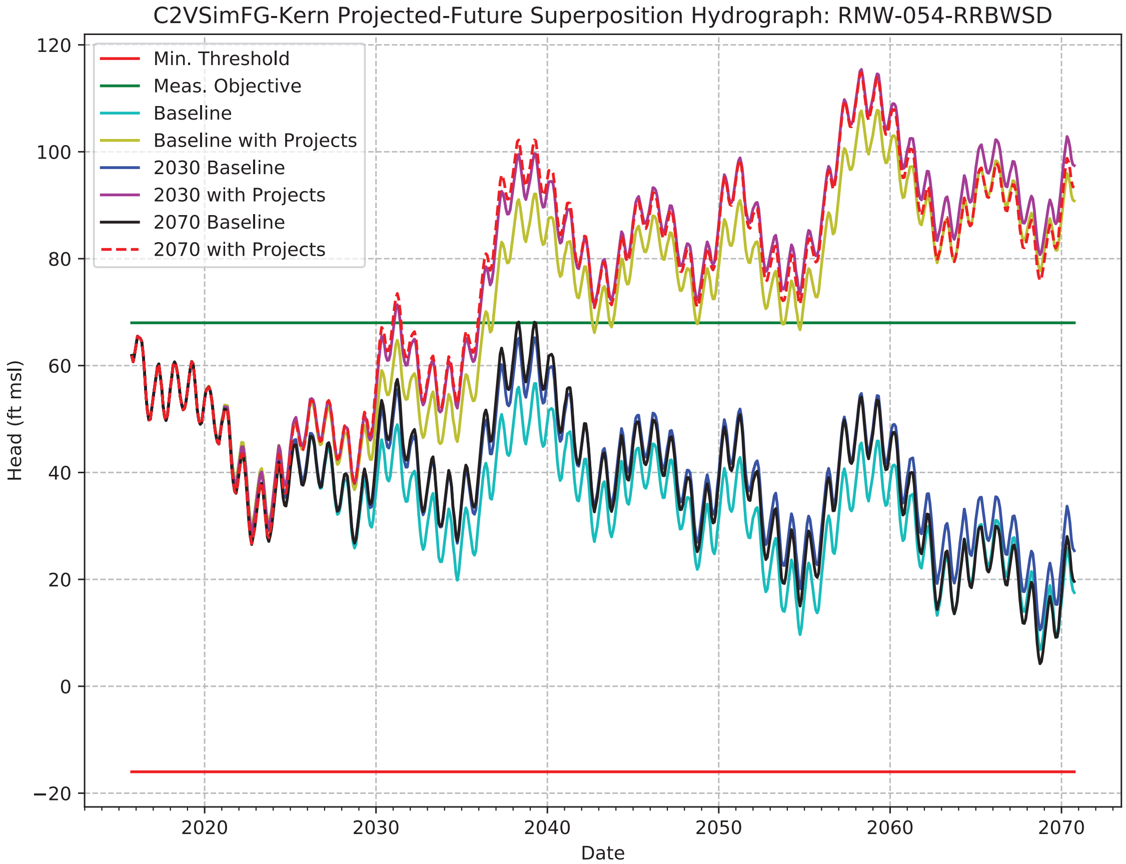
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-054-RRBWSD
Min. Threshold
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Baseline with Projects
2030 Baseline
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2070 Baseline
2070 with Projects
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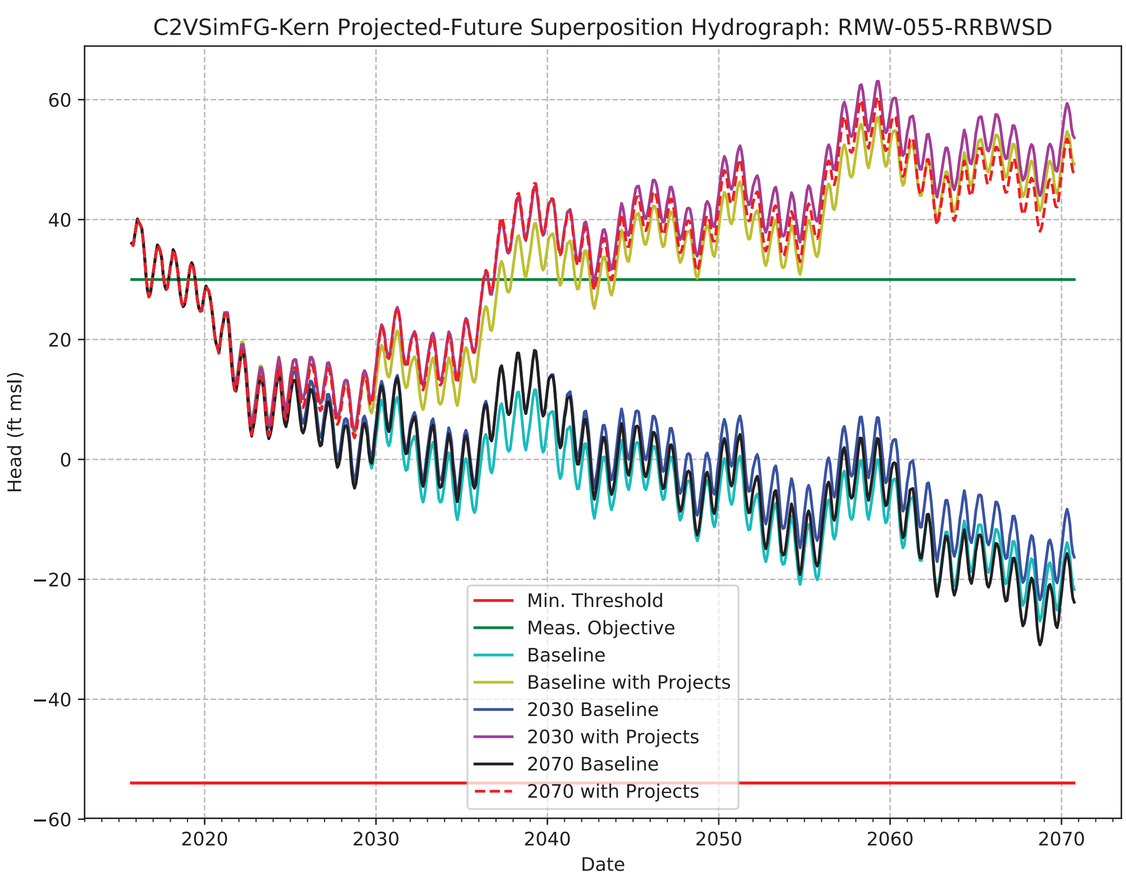
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-055-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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2070 with Projects
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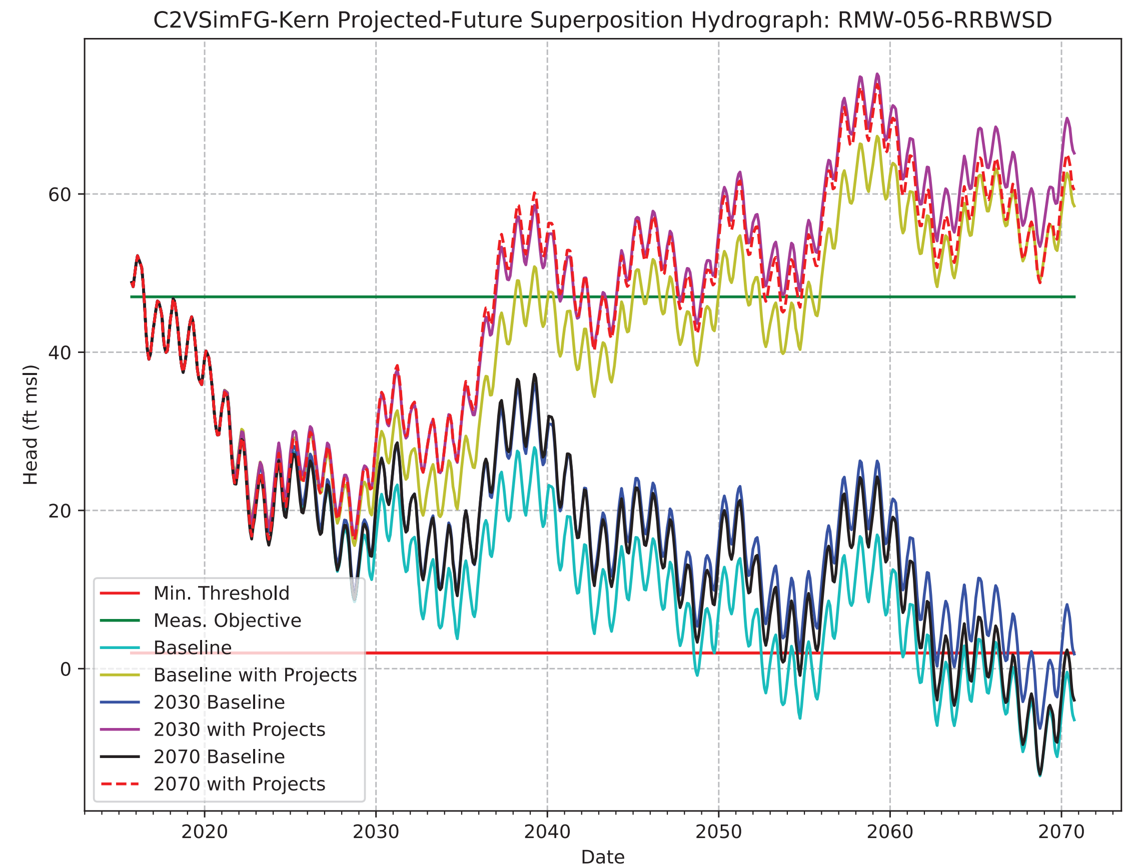
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-056-RRBWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
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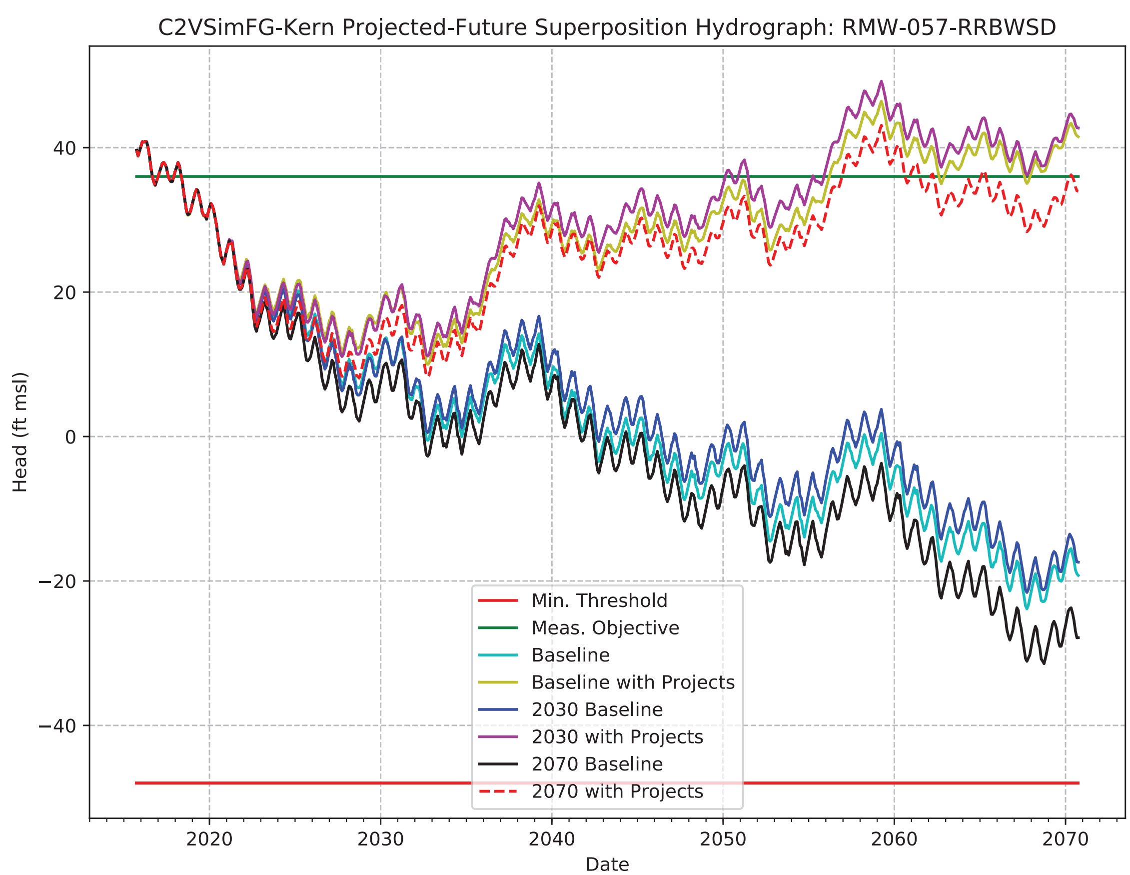
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-057-RRBWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
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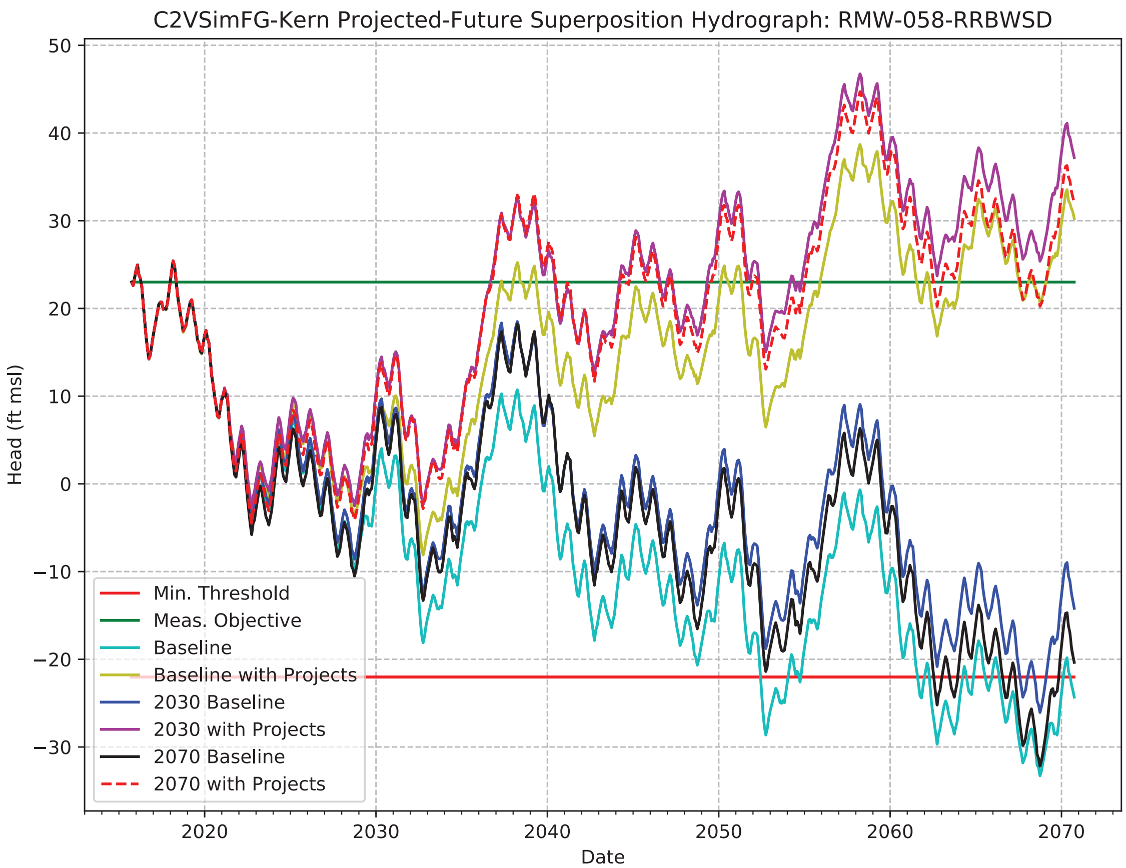
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-058-RRBWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
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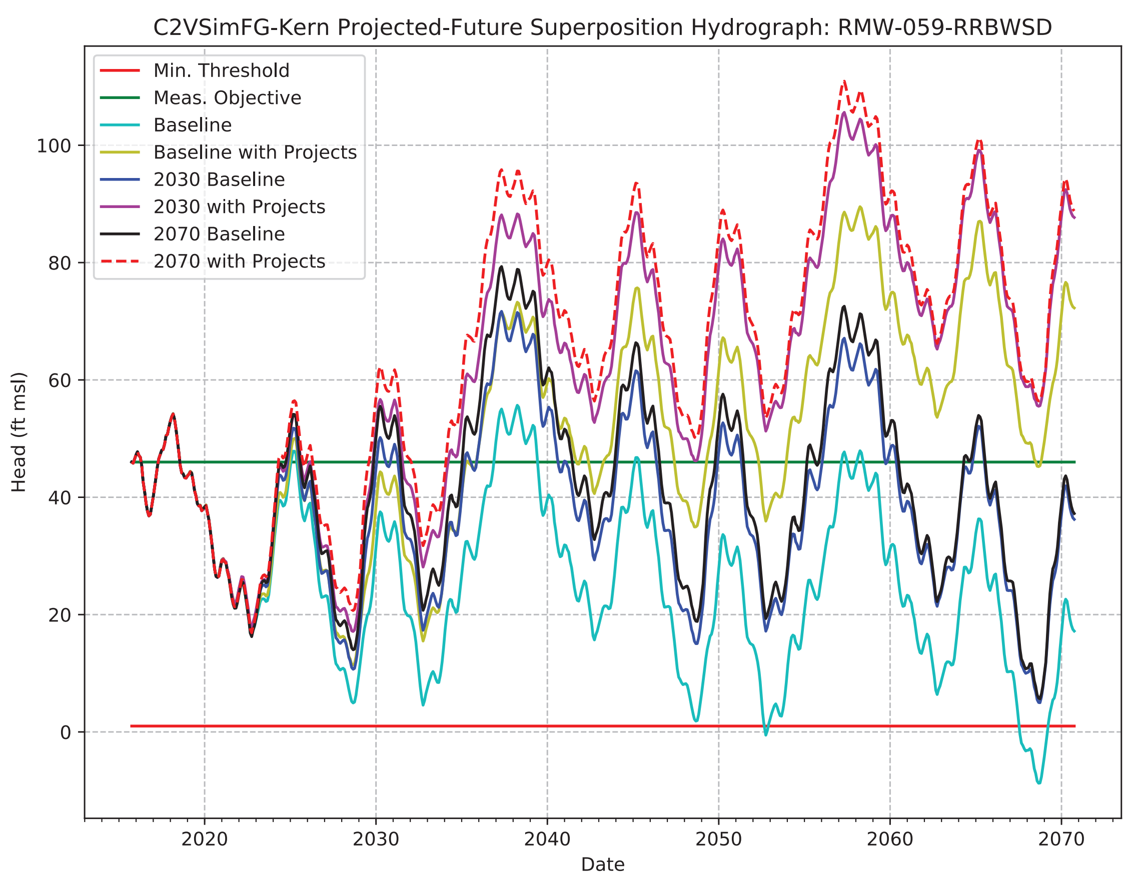
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-059-RRBWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
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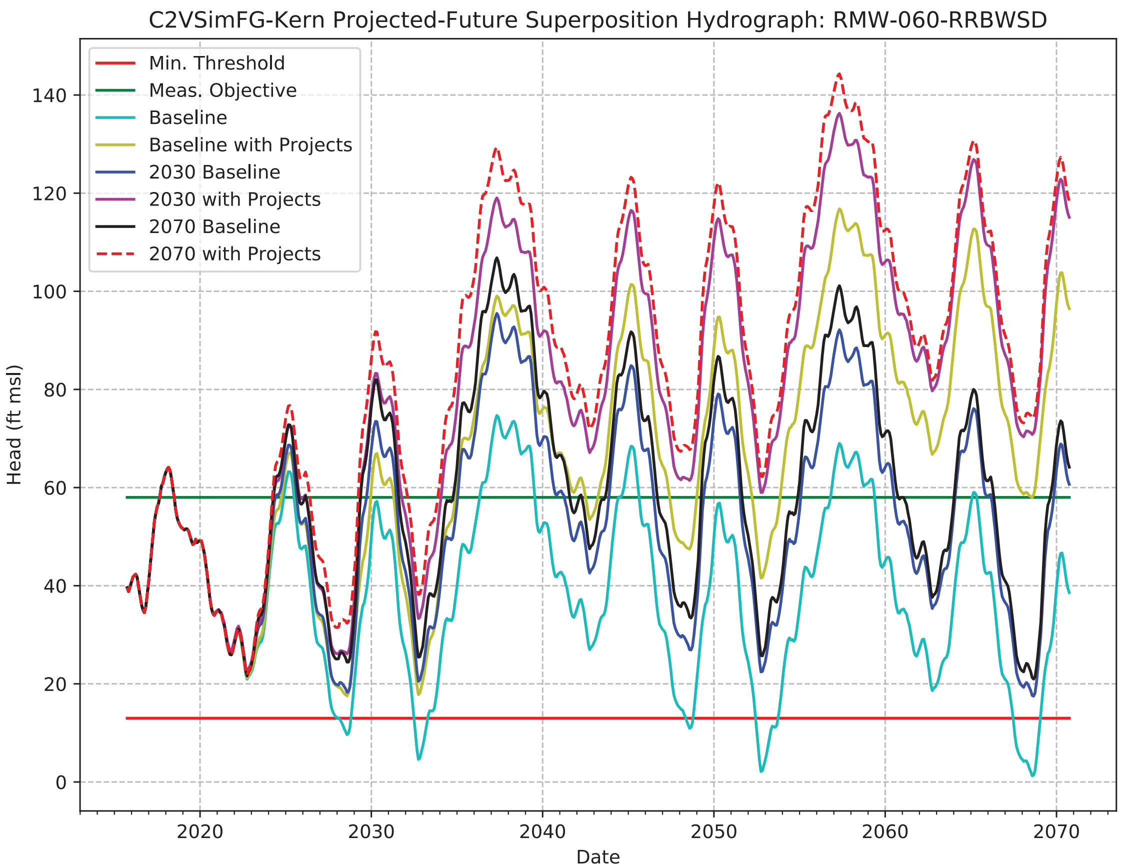
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-060-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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60
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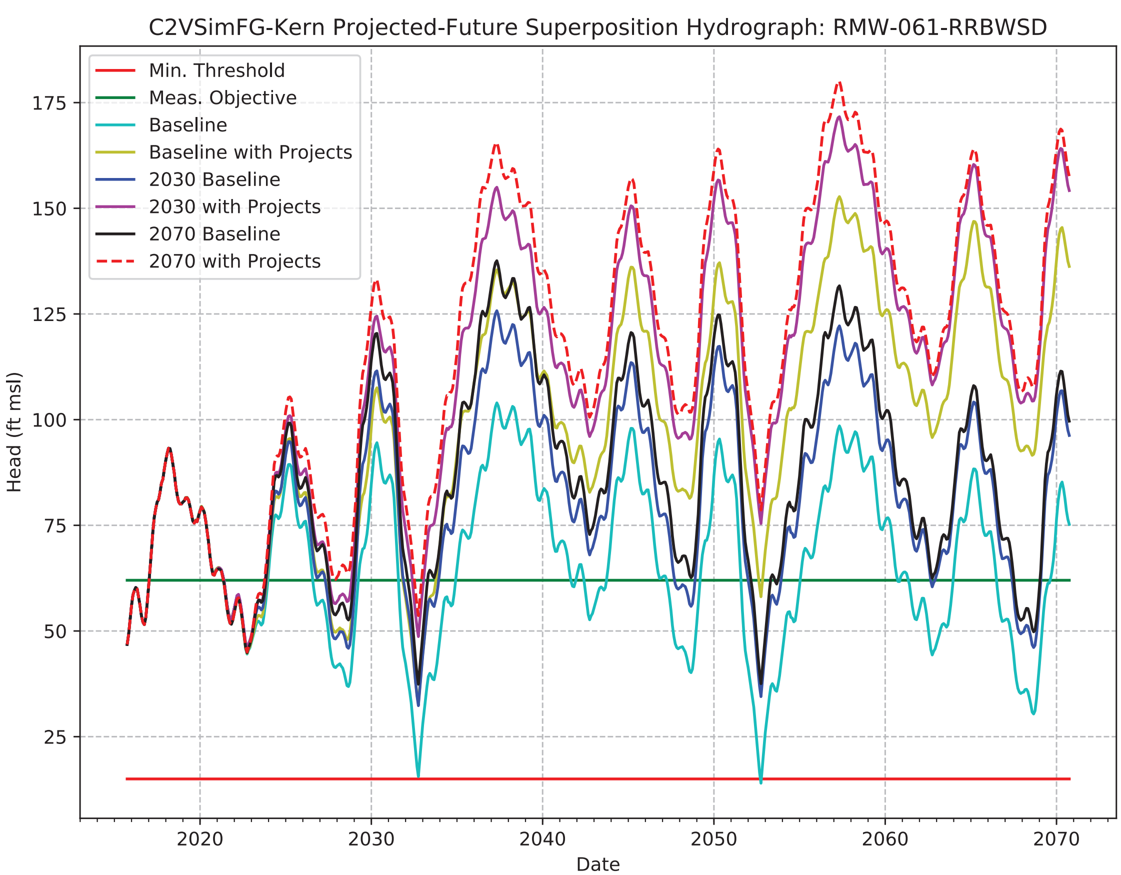
100
120
140
2020
2030
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-061-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
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125
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2020
2030
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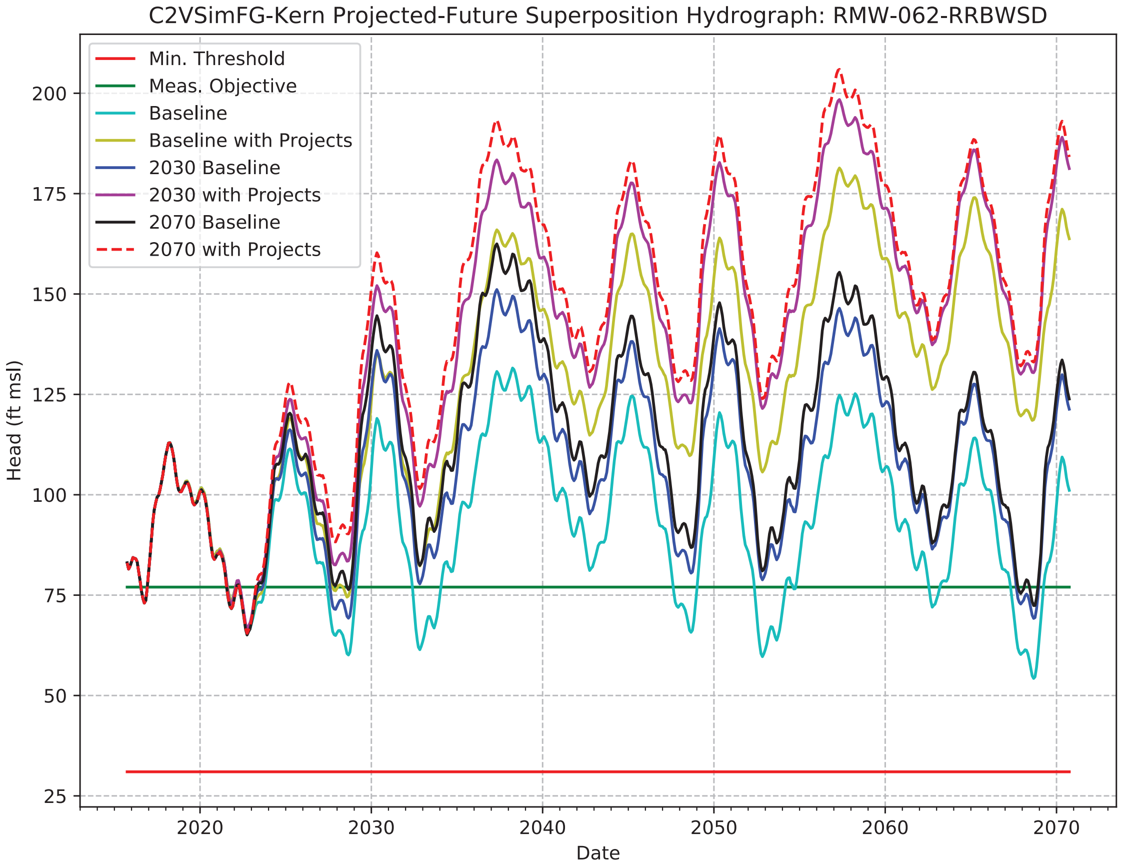
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-062-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
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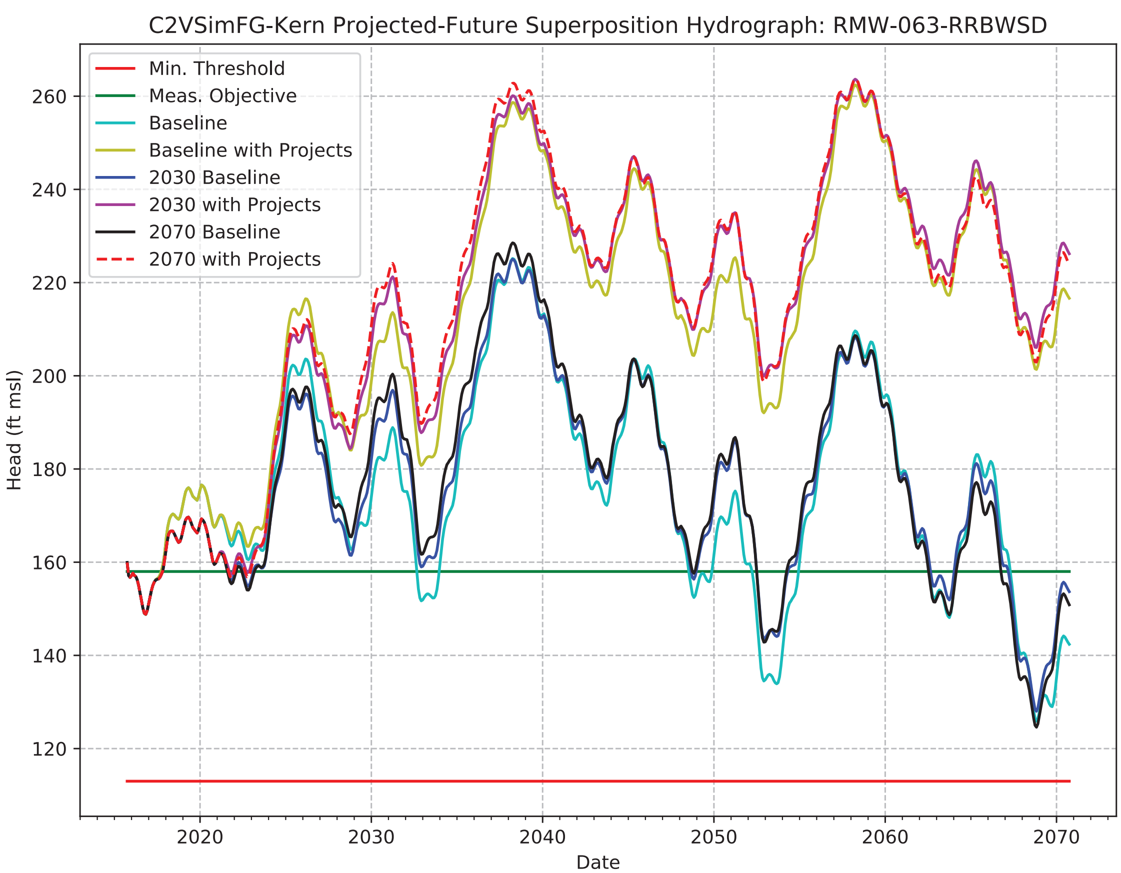
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-063-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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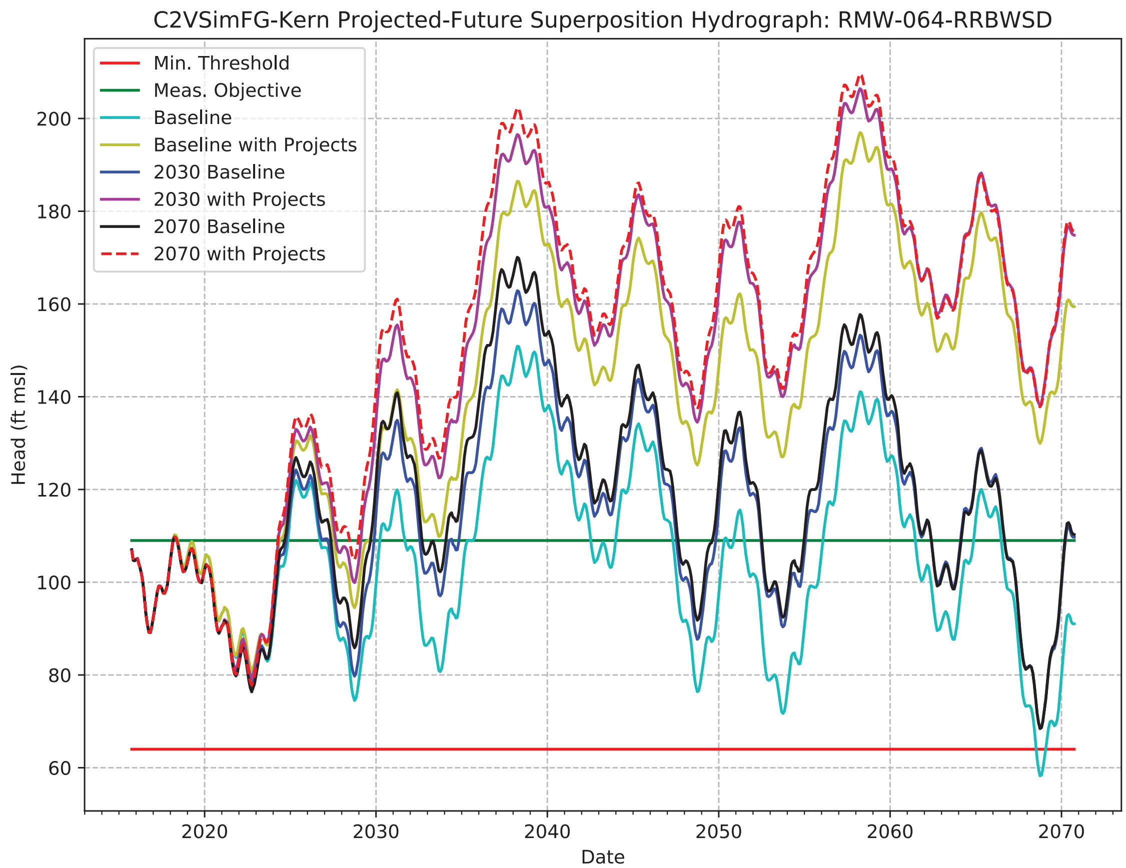
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-064-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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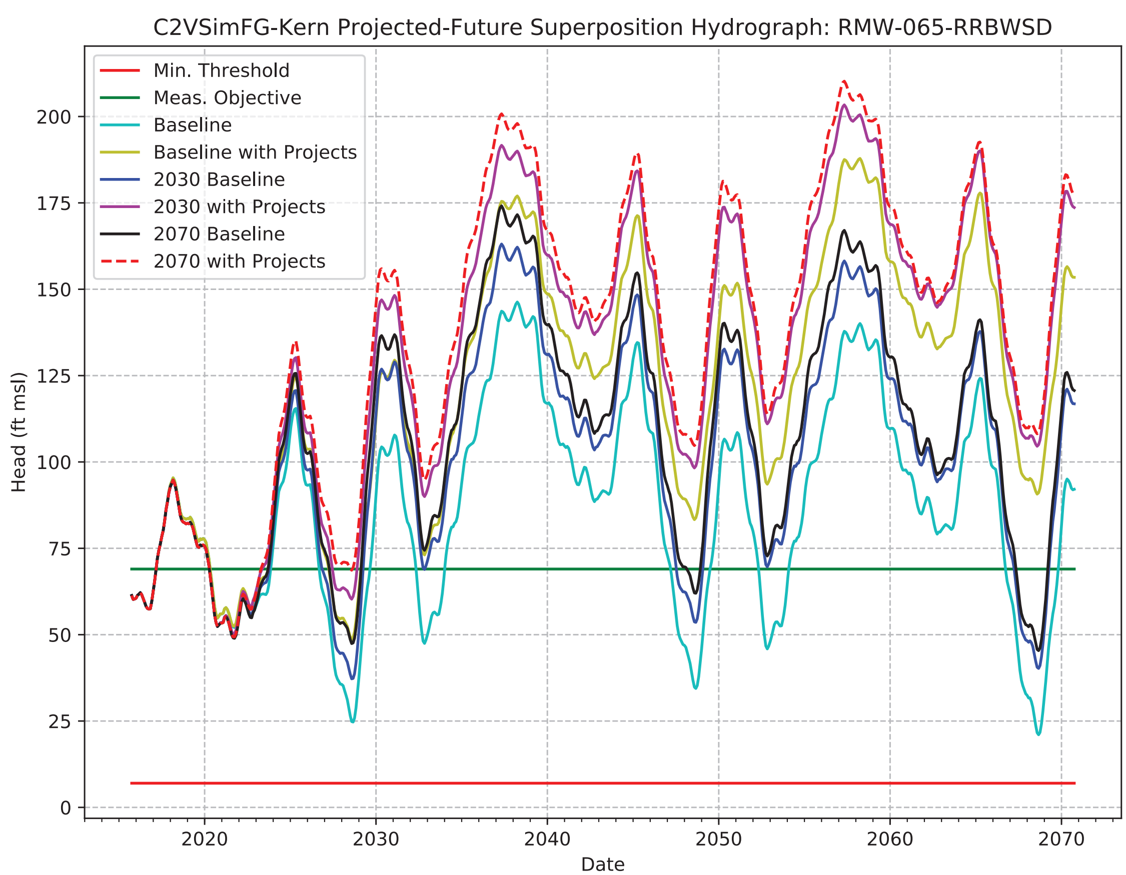
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-065-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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75
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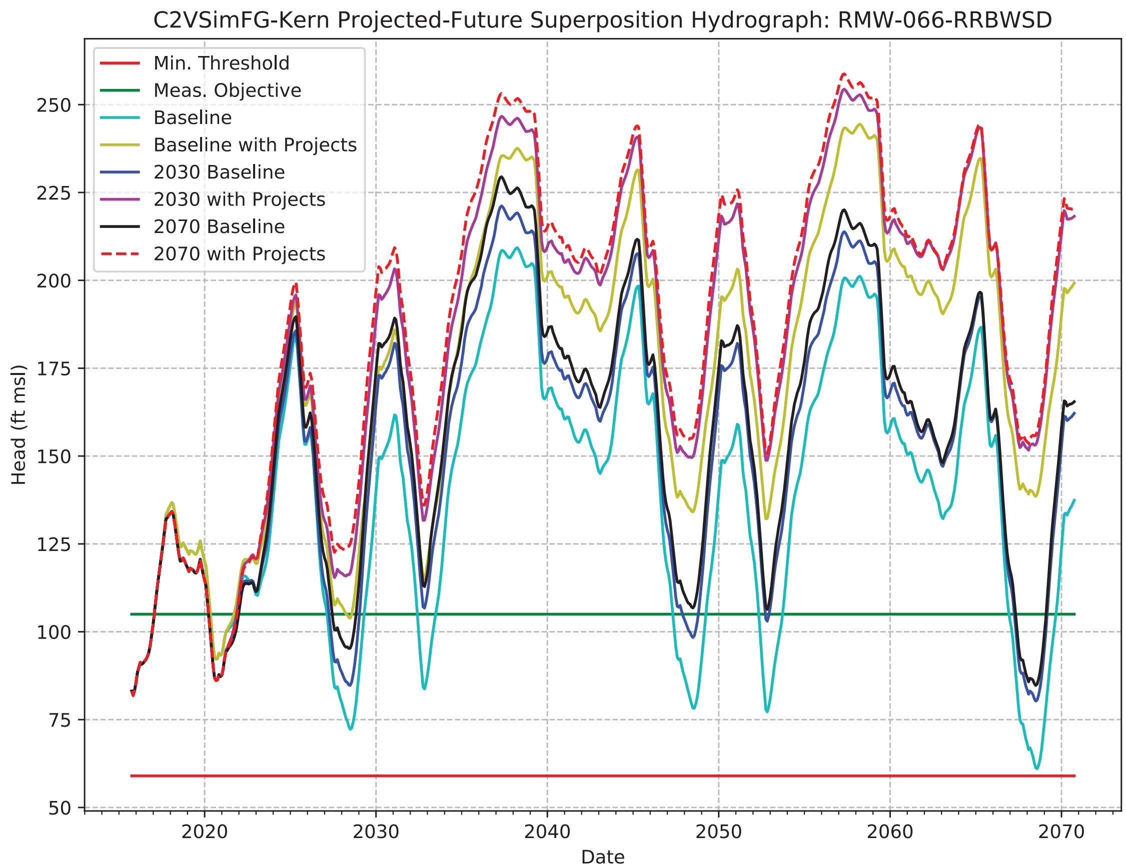
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-066-RRBWSD
Min. Threshold
Meas. Objective
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2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
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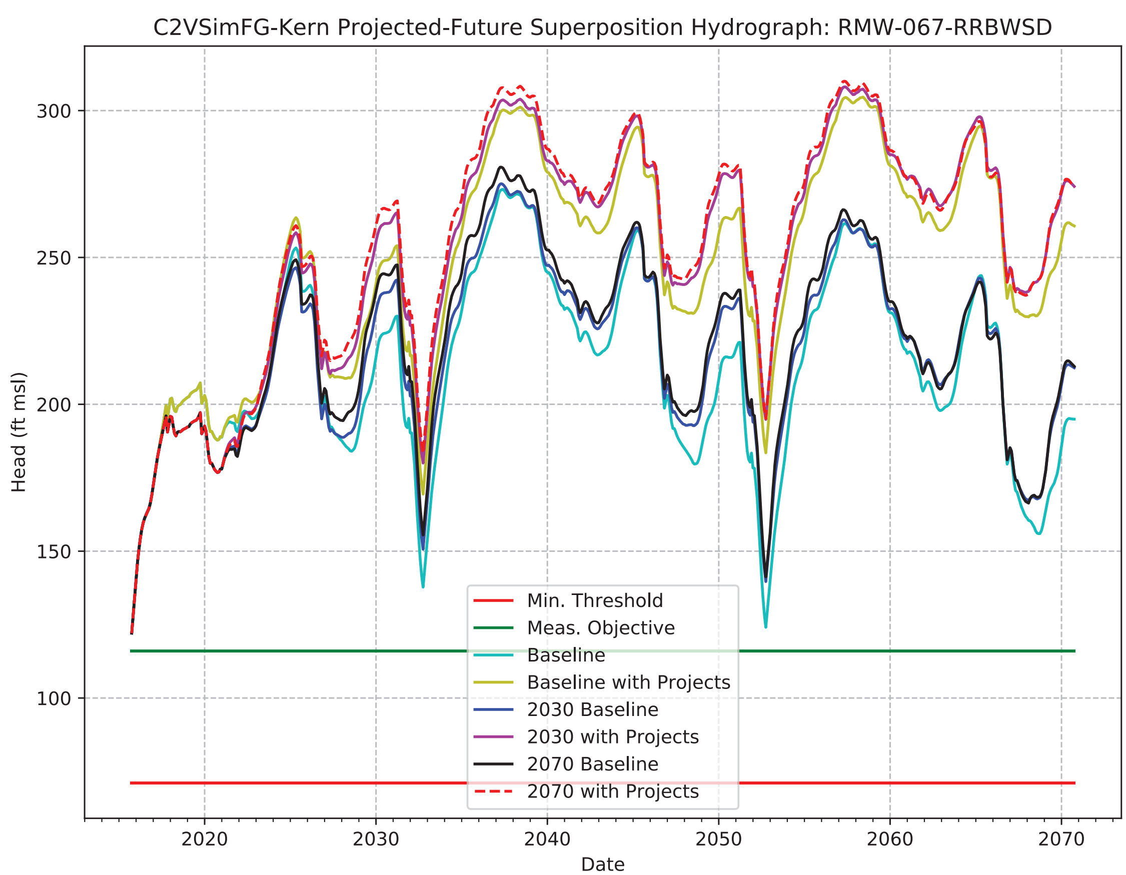
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-067-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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Head (ft msl)
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250
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2020
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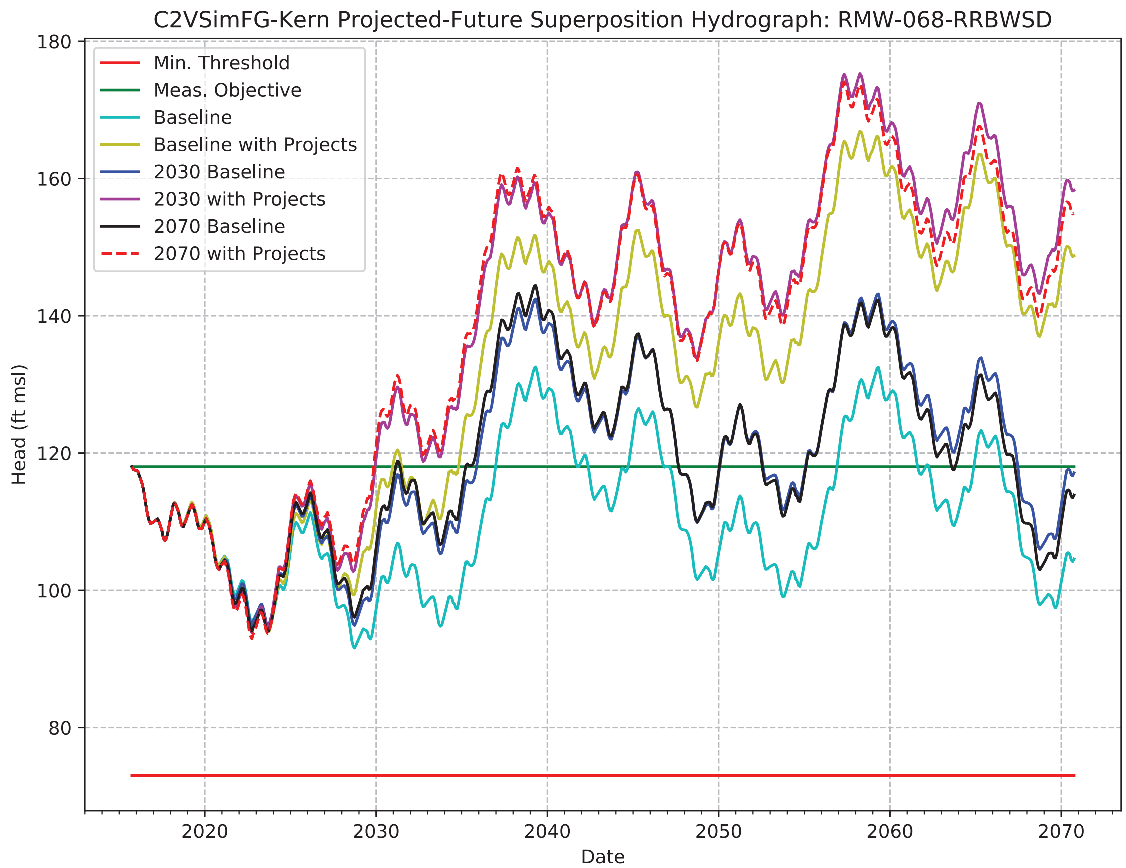
2070
Date



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-068-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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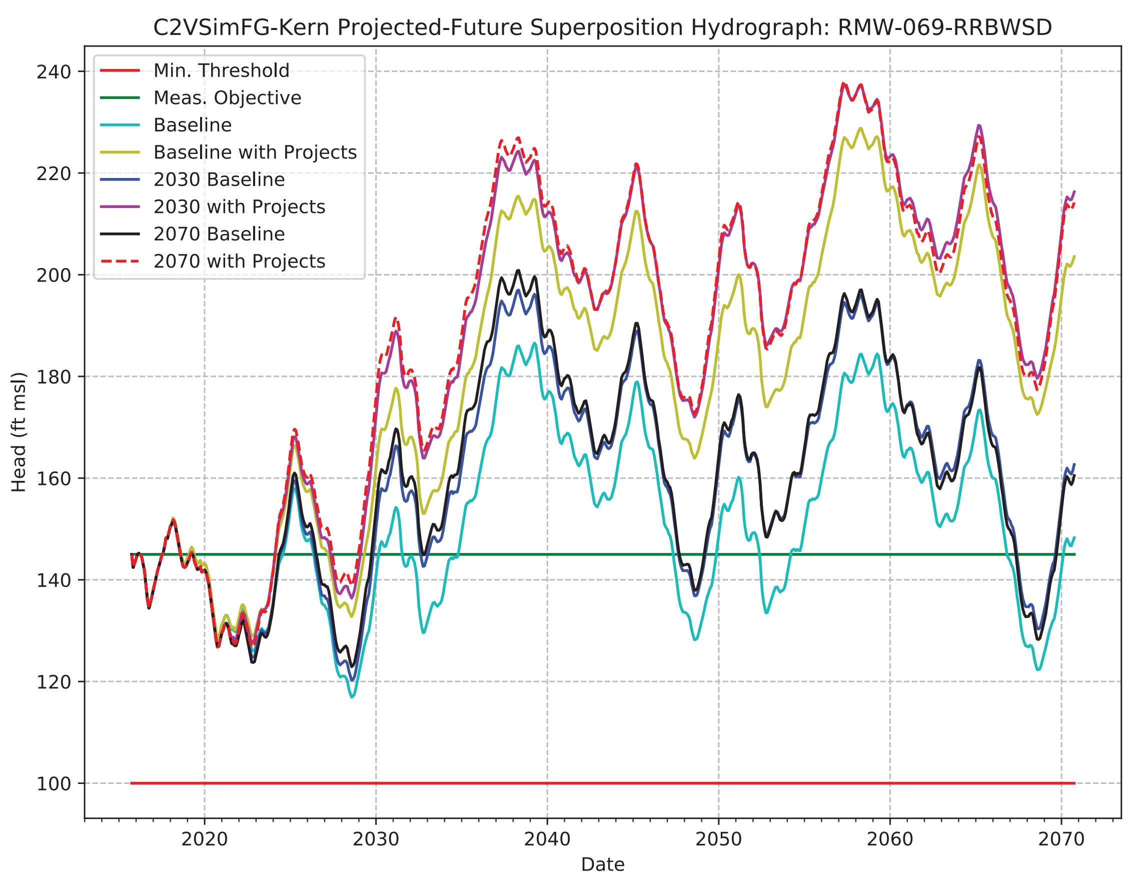
2060
2070
Date

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-069-RRBWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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220
200
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120
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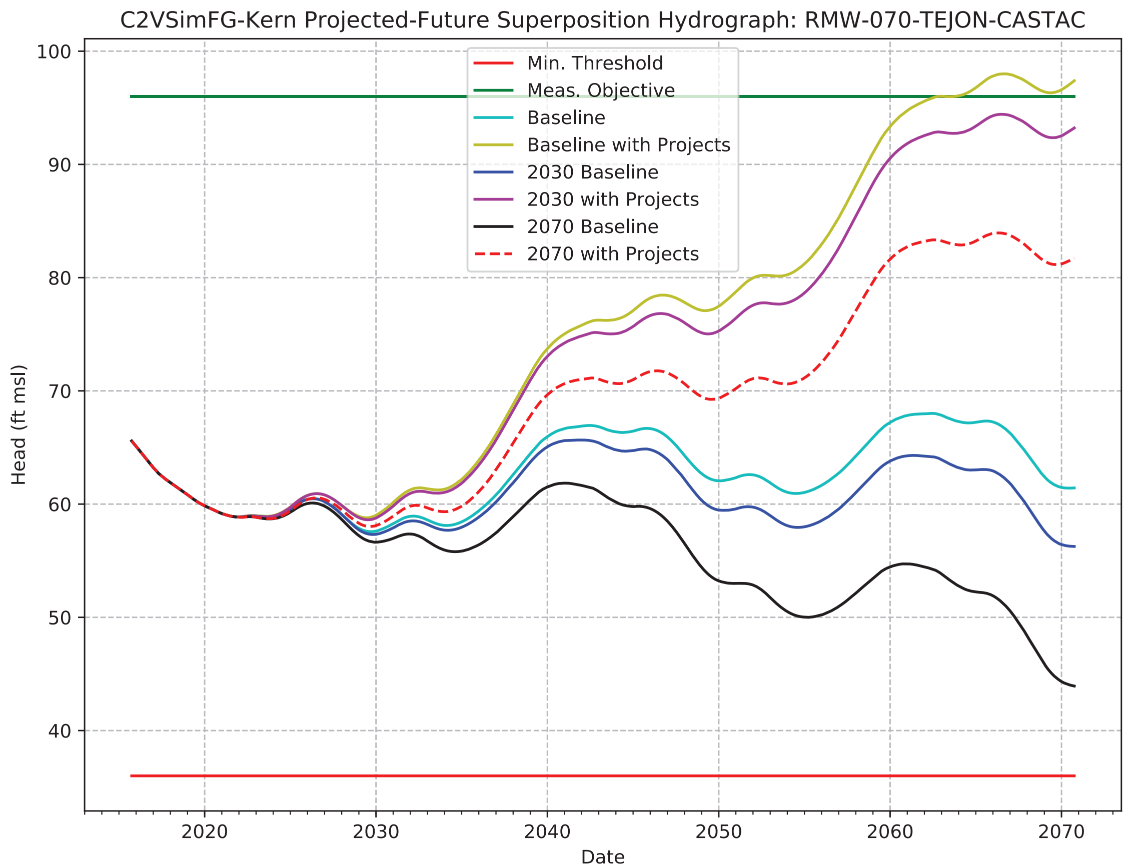
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-070-TEJON-CASTAC
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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90
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70
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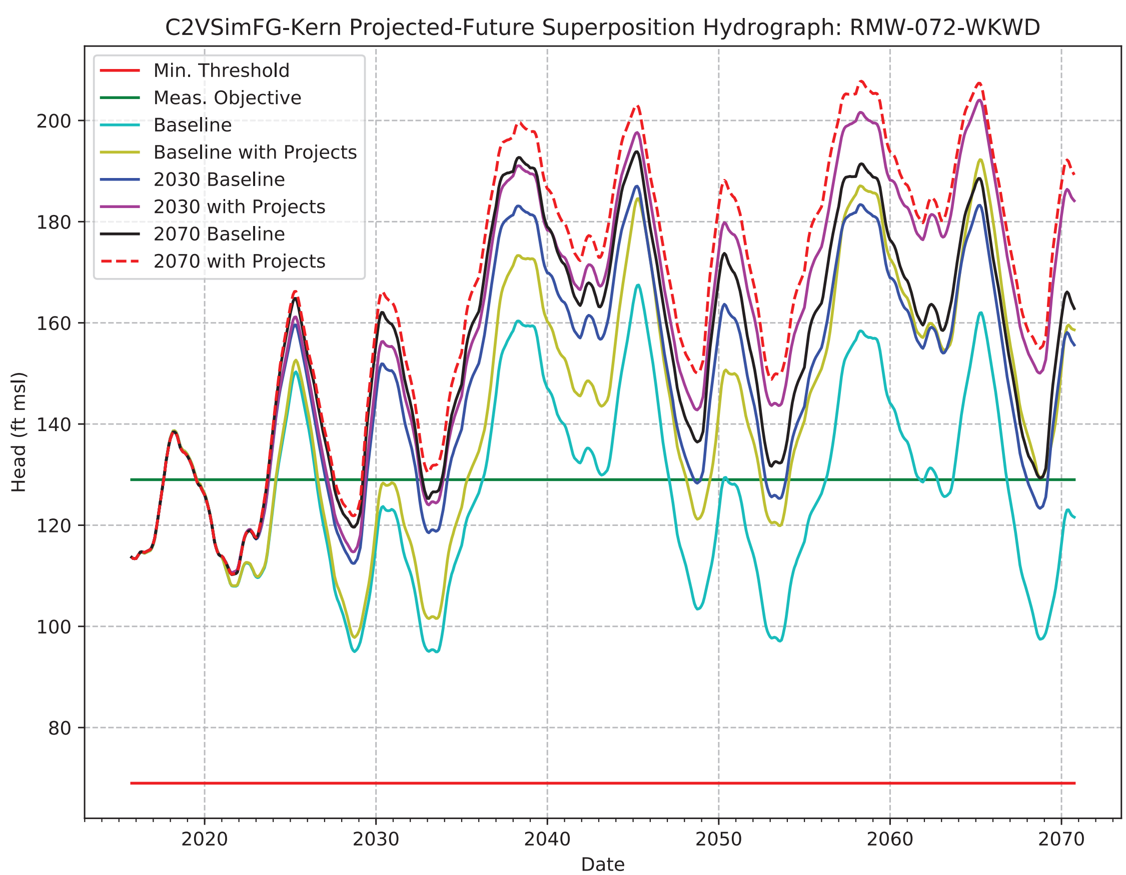
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-072-WKWD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
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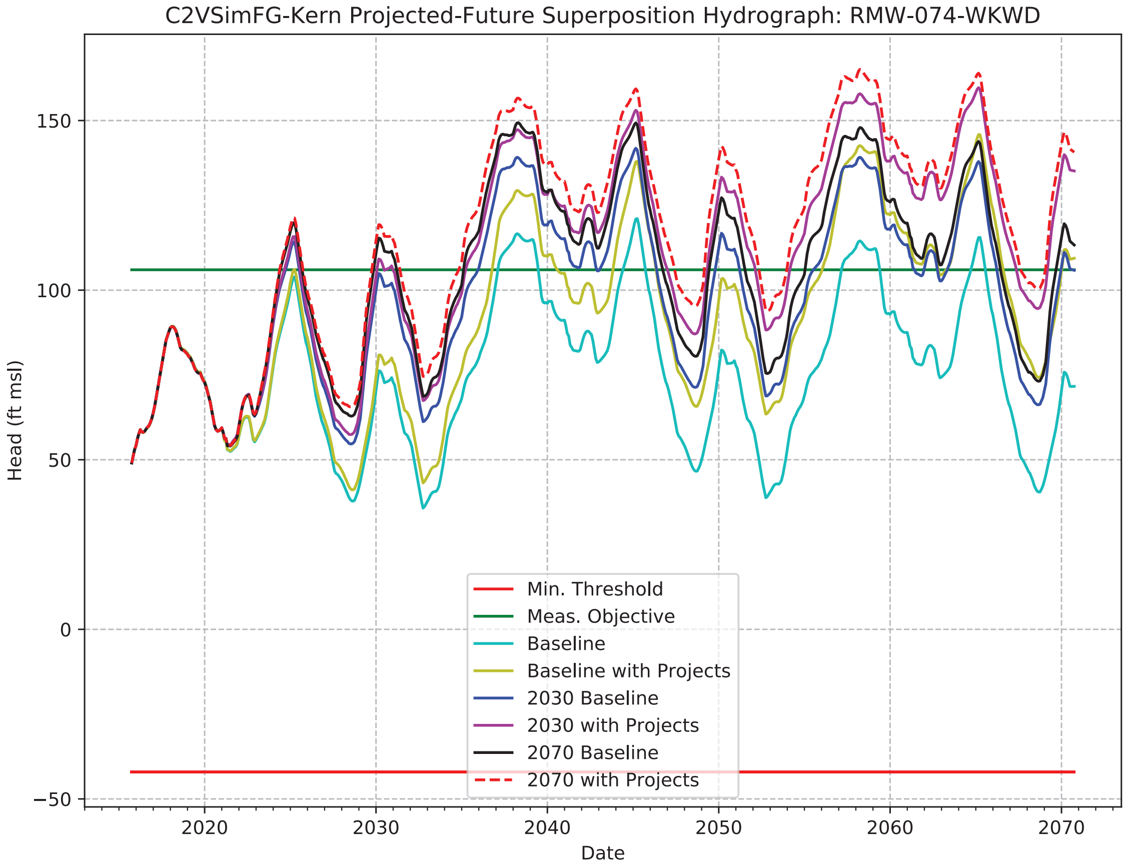
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-074-WKWD
Head (ft msl)
150
100
50
0
−50
2020
2030
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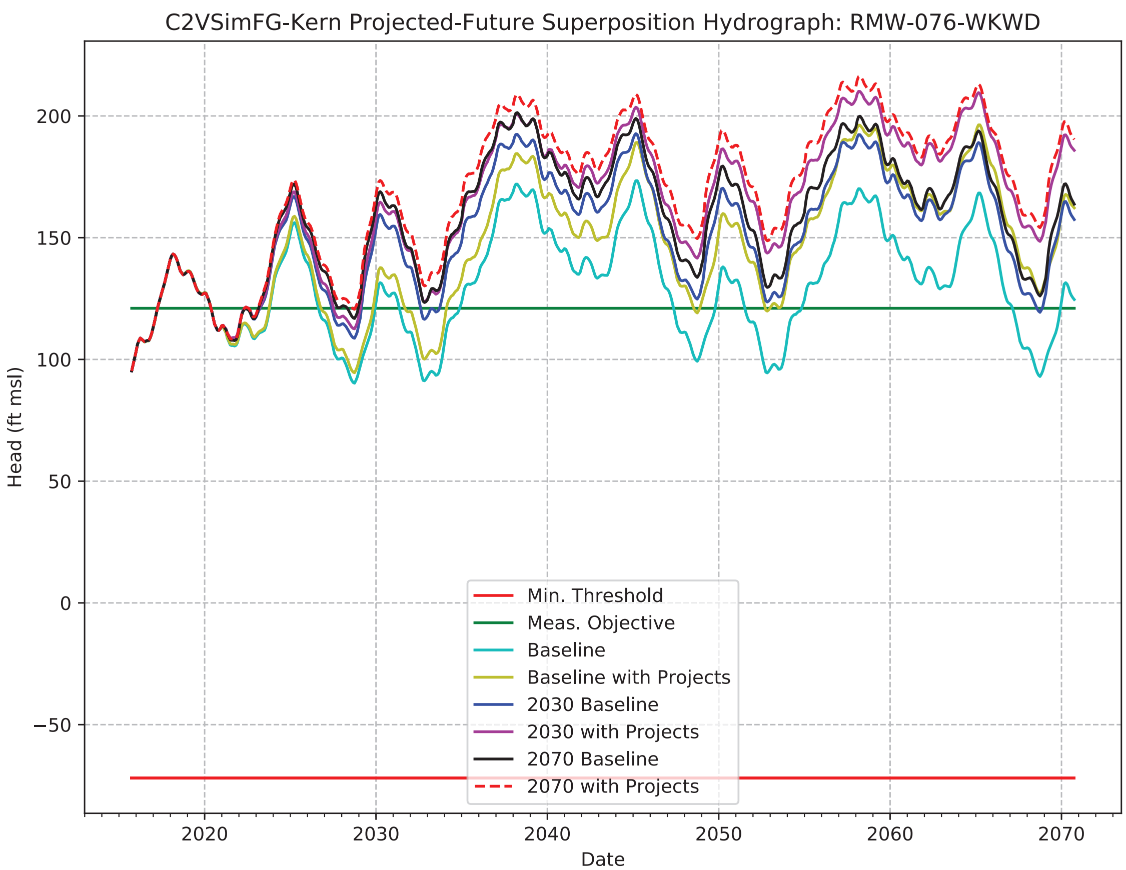
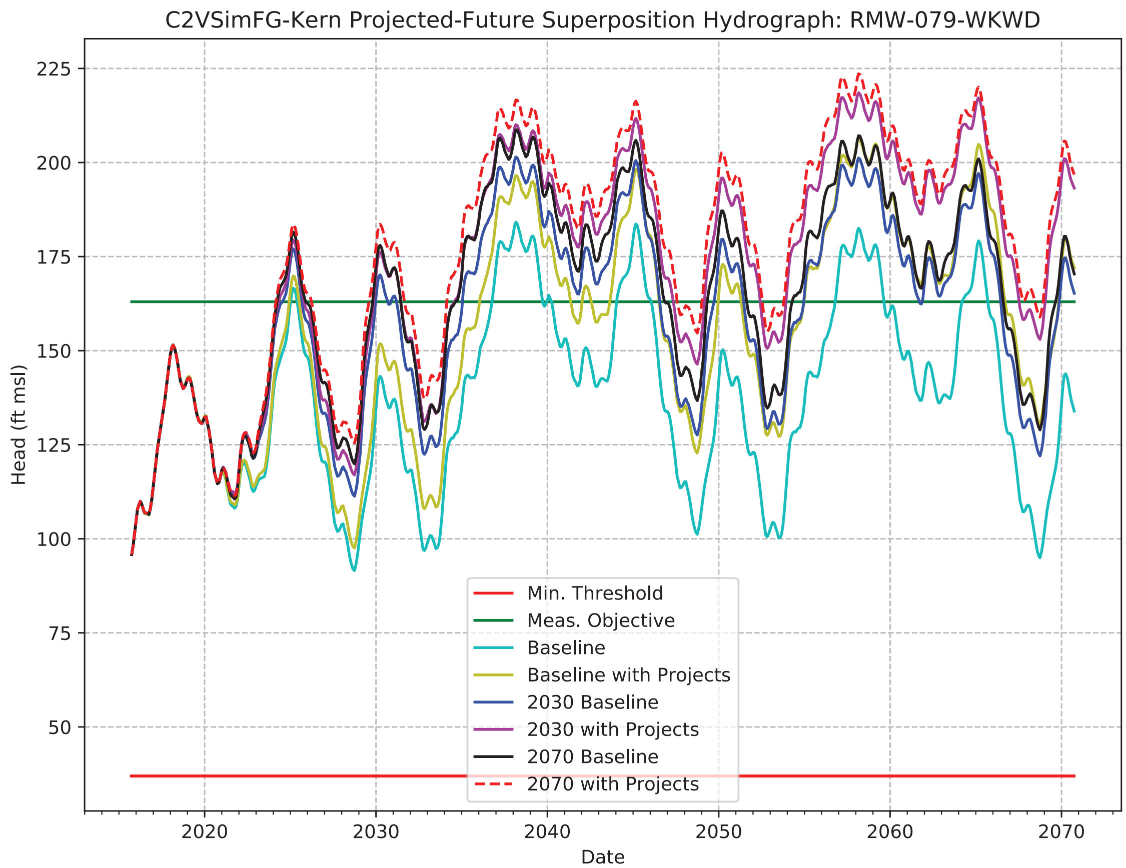
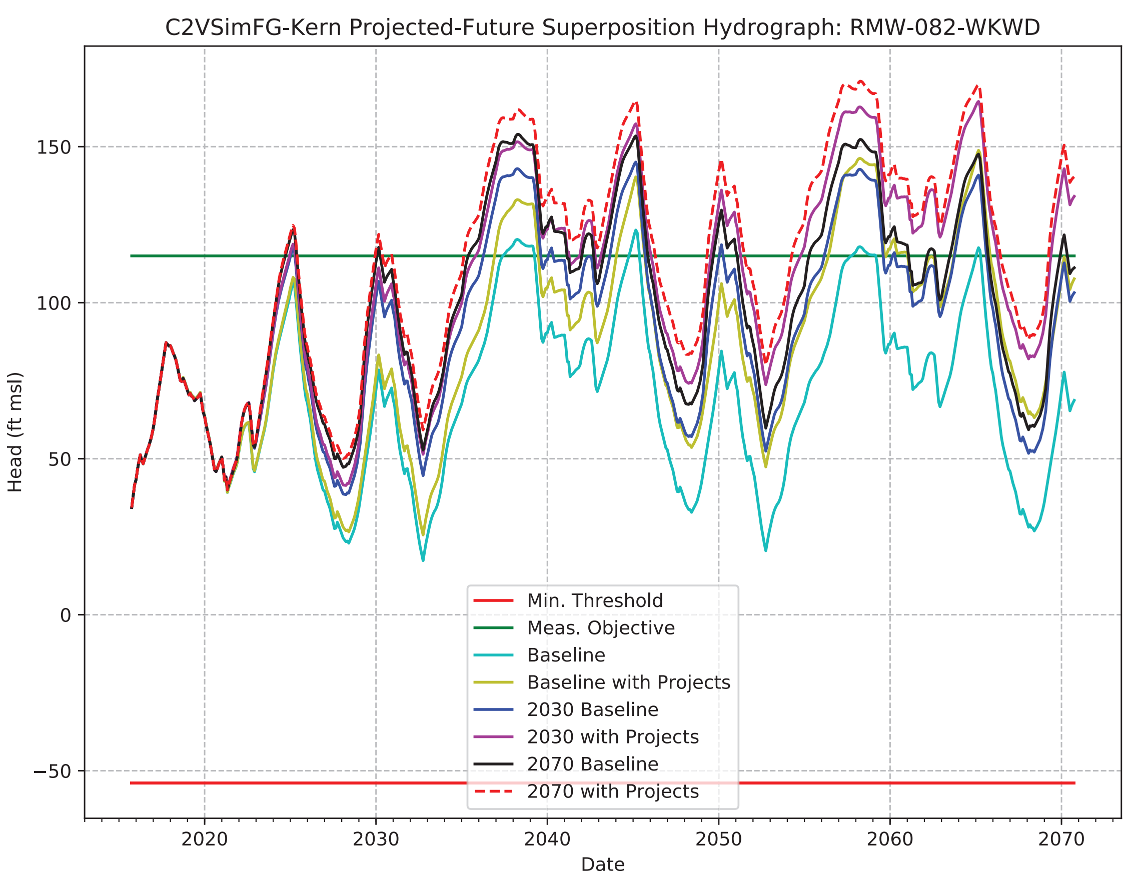
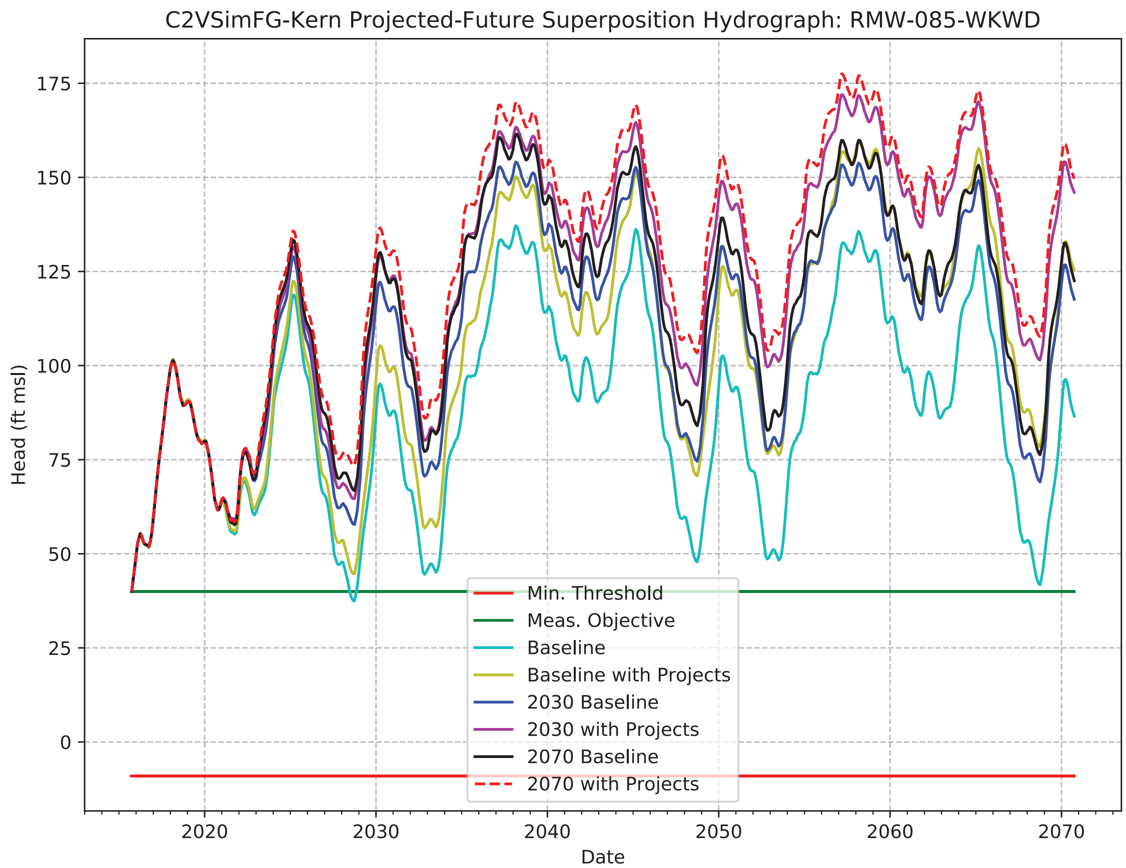
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

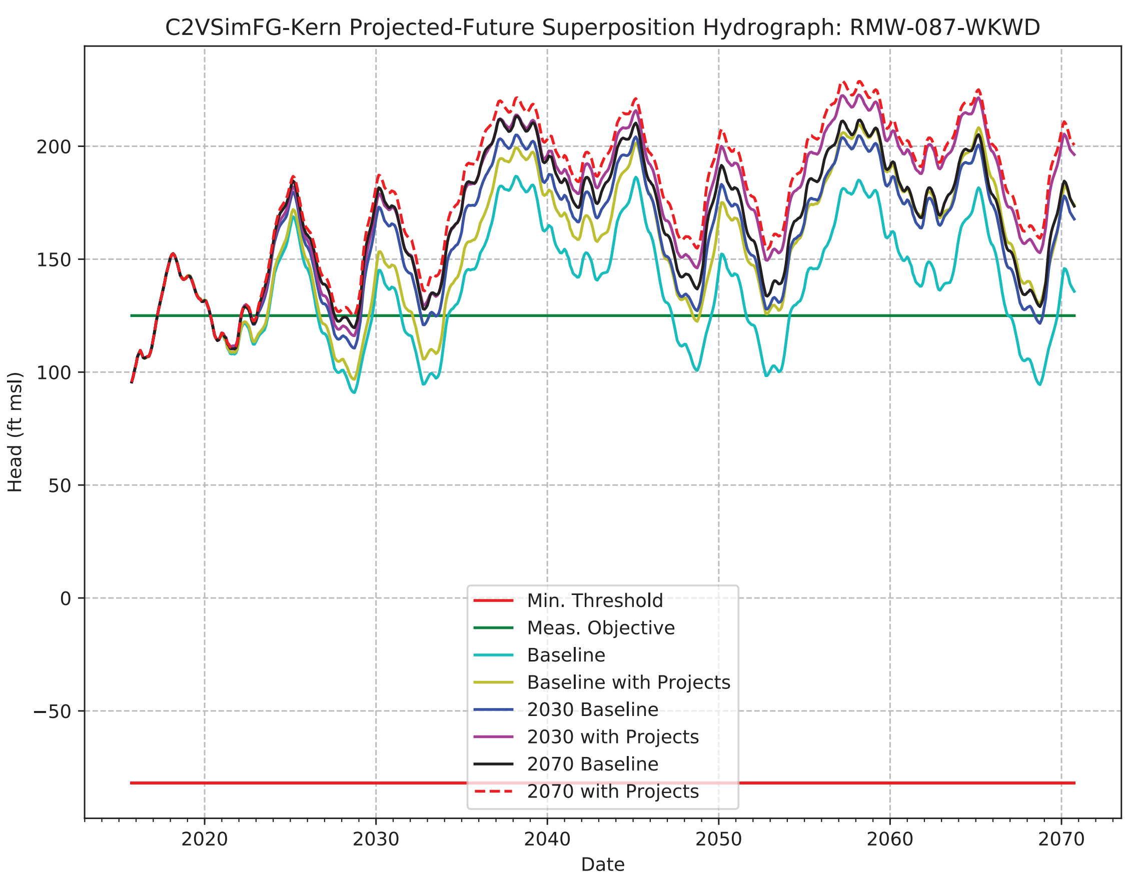

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-076-WKWD
Head (ft msl)
200
150
100
50
0
−50
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-079-WKWD
Head (ft msl)
Date
225
200
175
150
125
100
75
50
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-082-WKWD
Head (ft msl)
Date
150
100
50
0
−50
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-085-WKWD
Head (ft msl)
175
150
125
100
75
50
25
0
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-087-WKWD
Head (ft msl)
200
150
100
50
0
−50
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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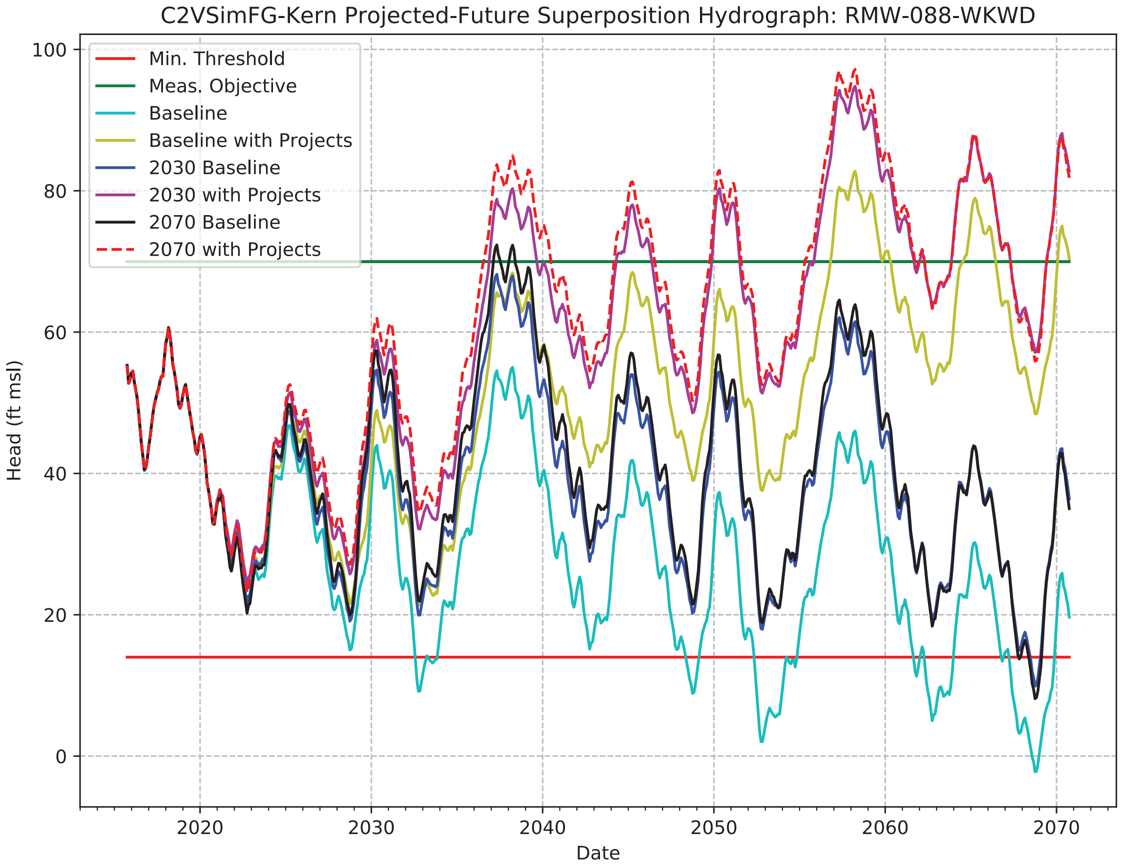
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-088-WKWD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
100
80
60
40
20
0
2020
2030
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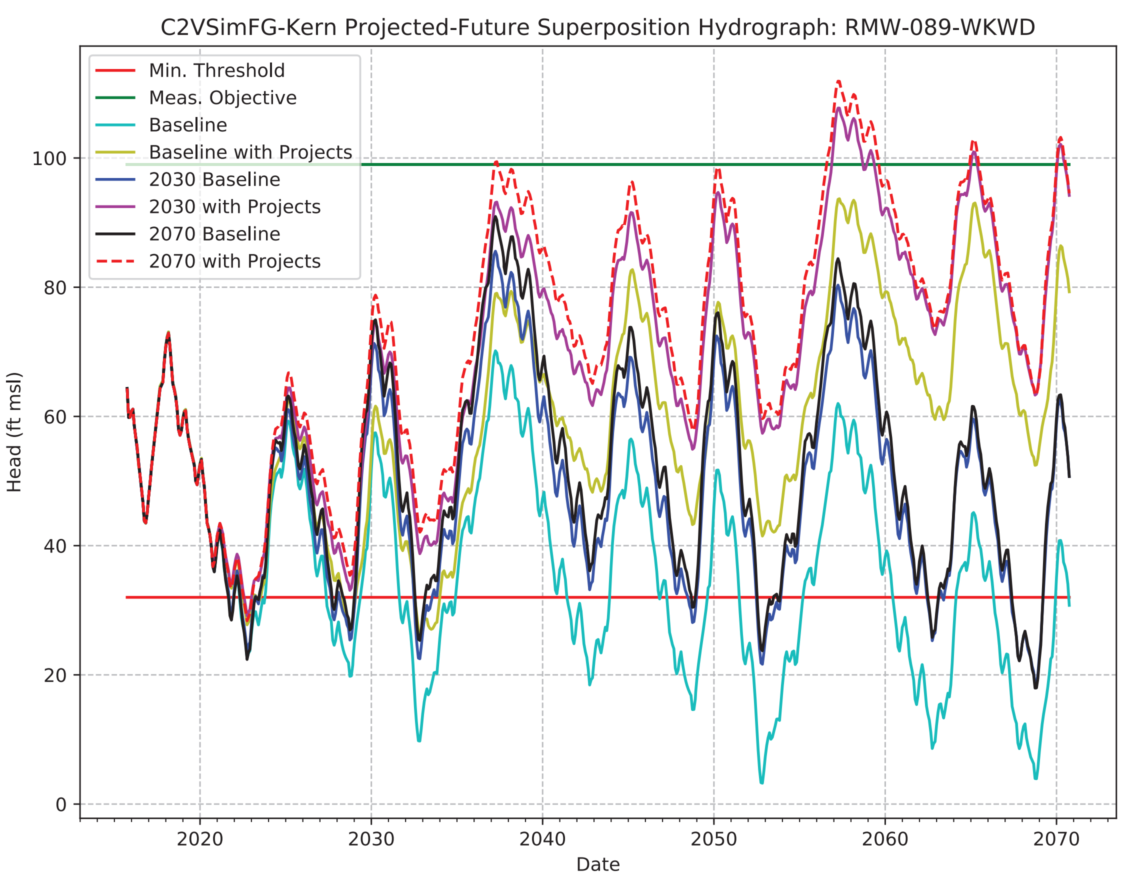
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-089-WKWD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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2070 with Projects
Head (ft msl)
100
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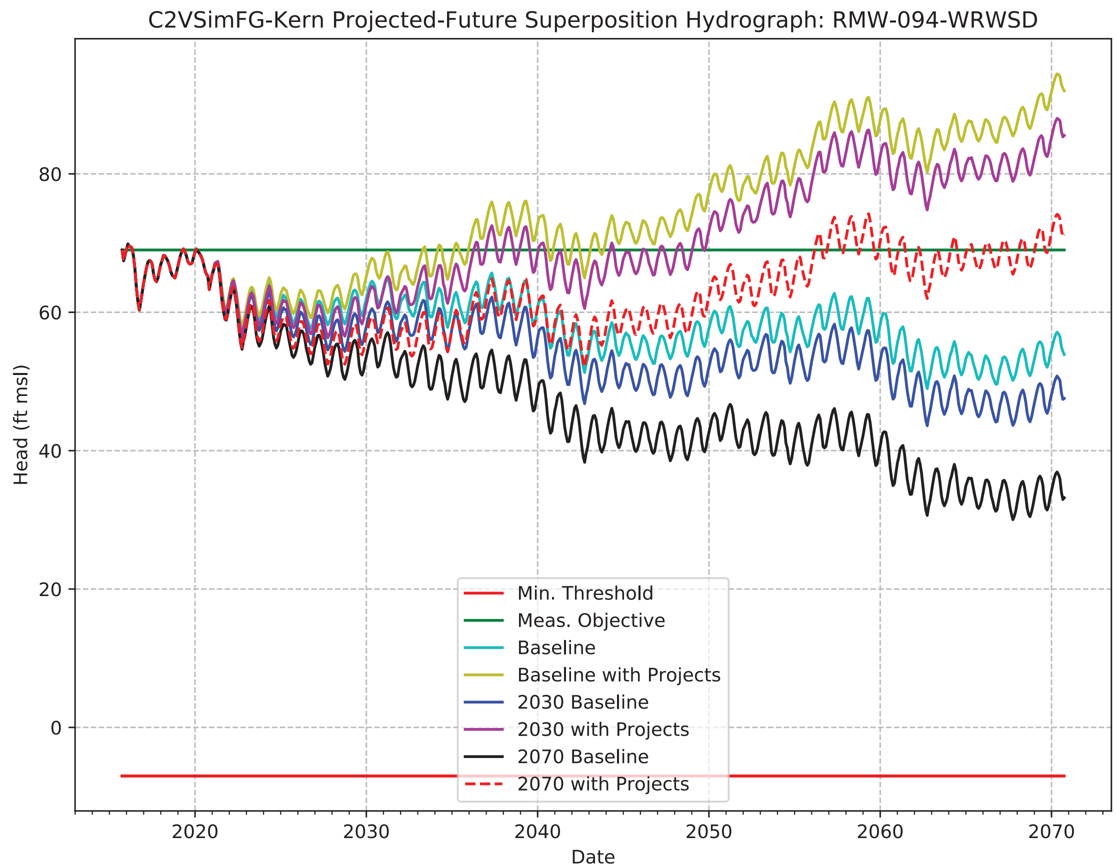
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-094-WRWSD
Head (ft msl)
80
60
40
20
0
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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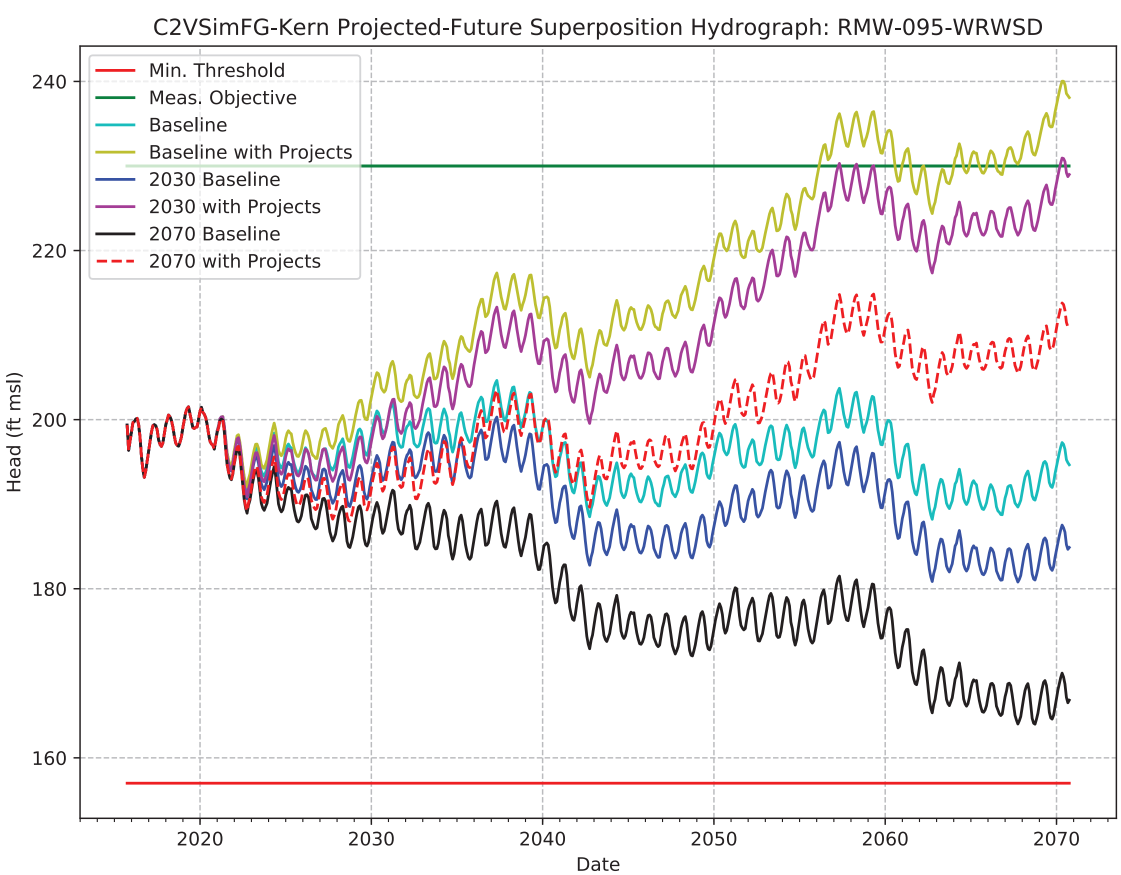
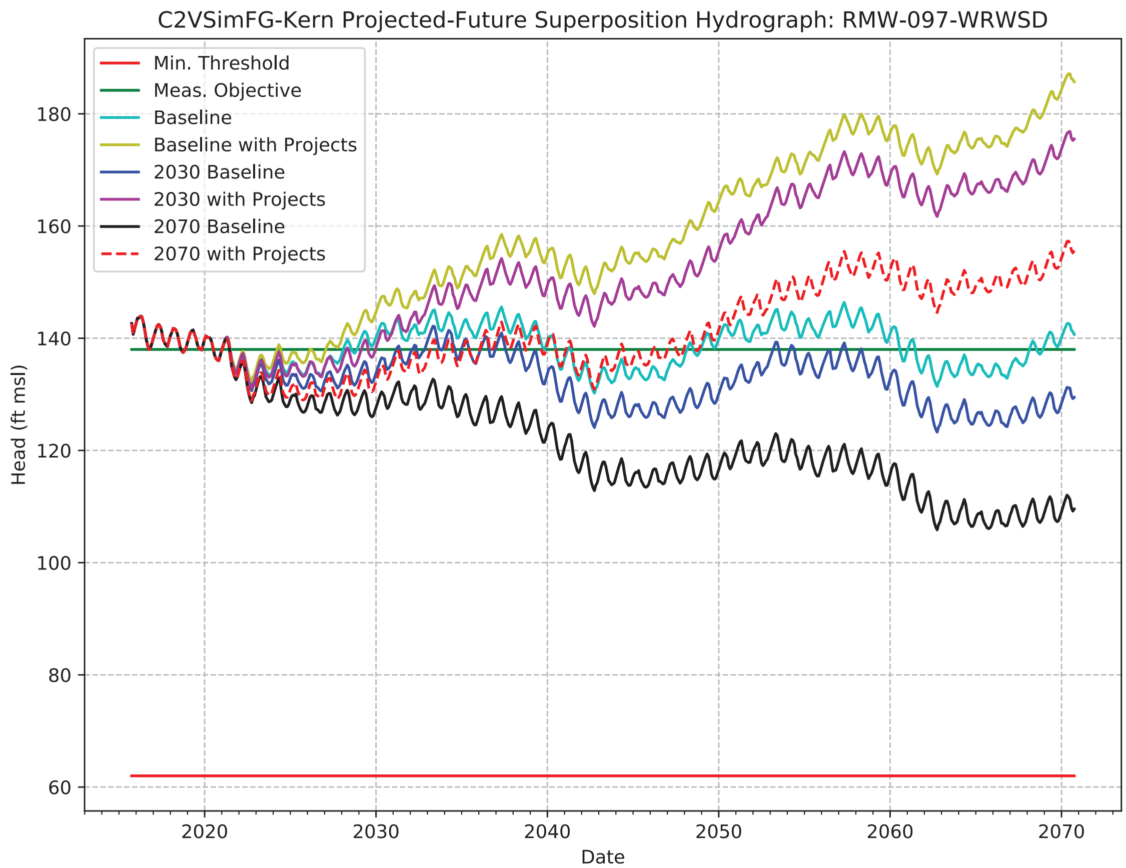
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-095-WRWSD
Head (ft msl)
240
220
200
180
160
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-097-WRWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
180
160
140
120
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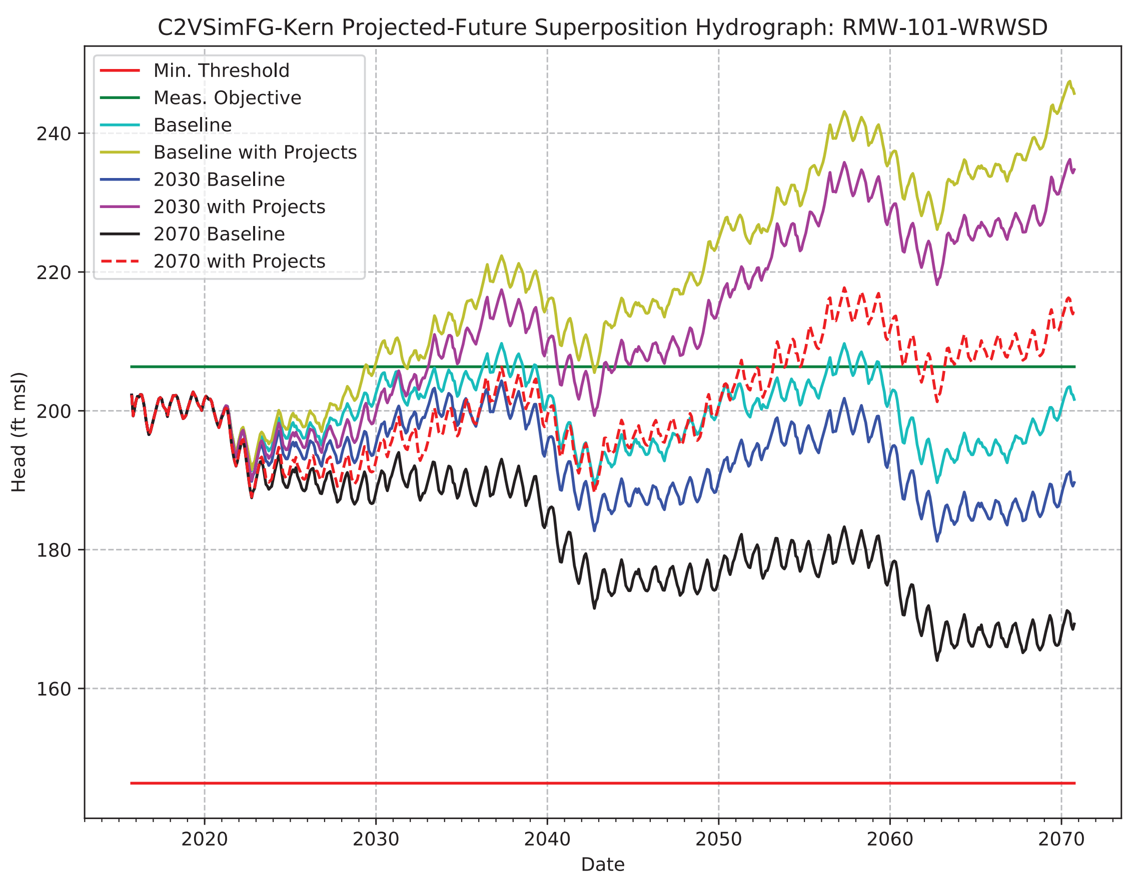
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-101-WRWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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220
200
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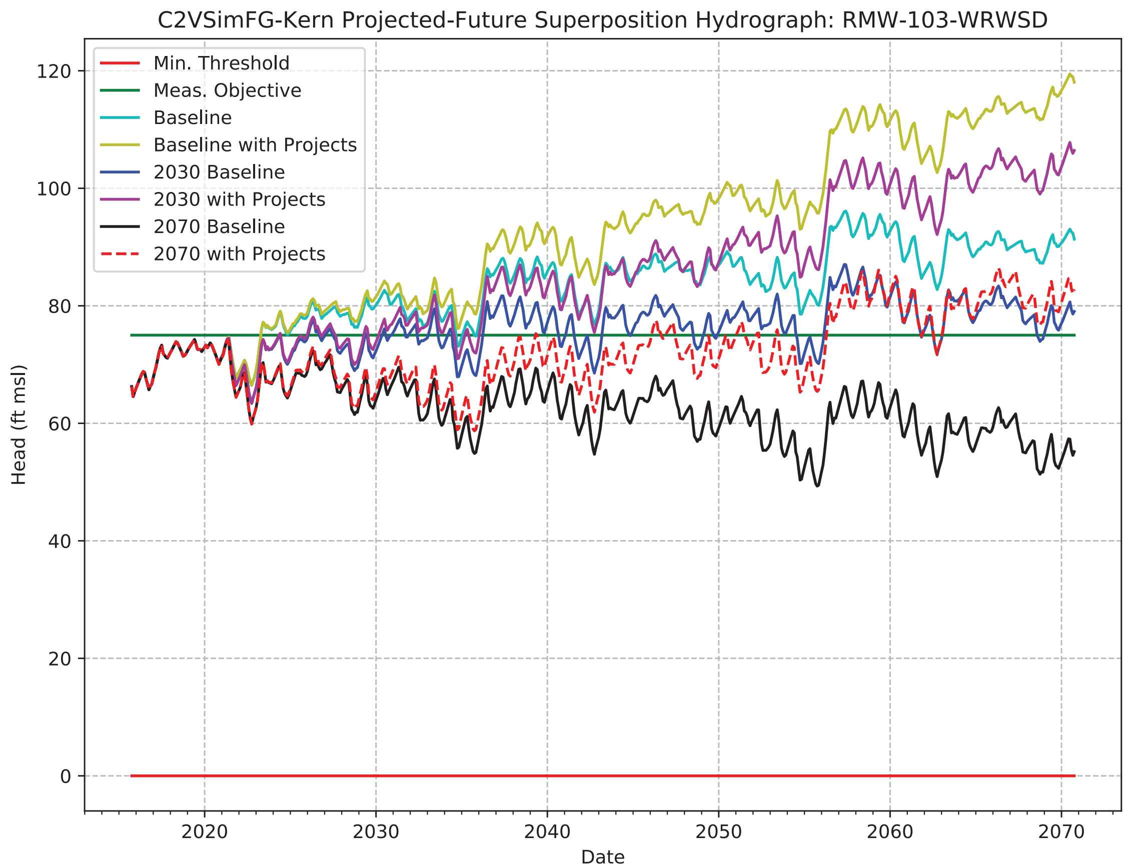
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-103-WRWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
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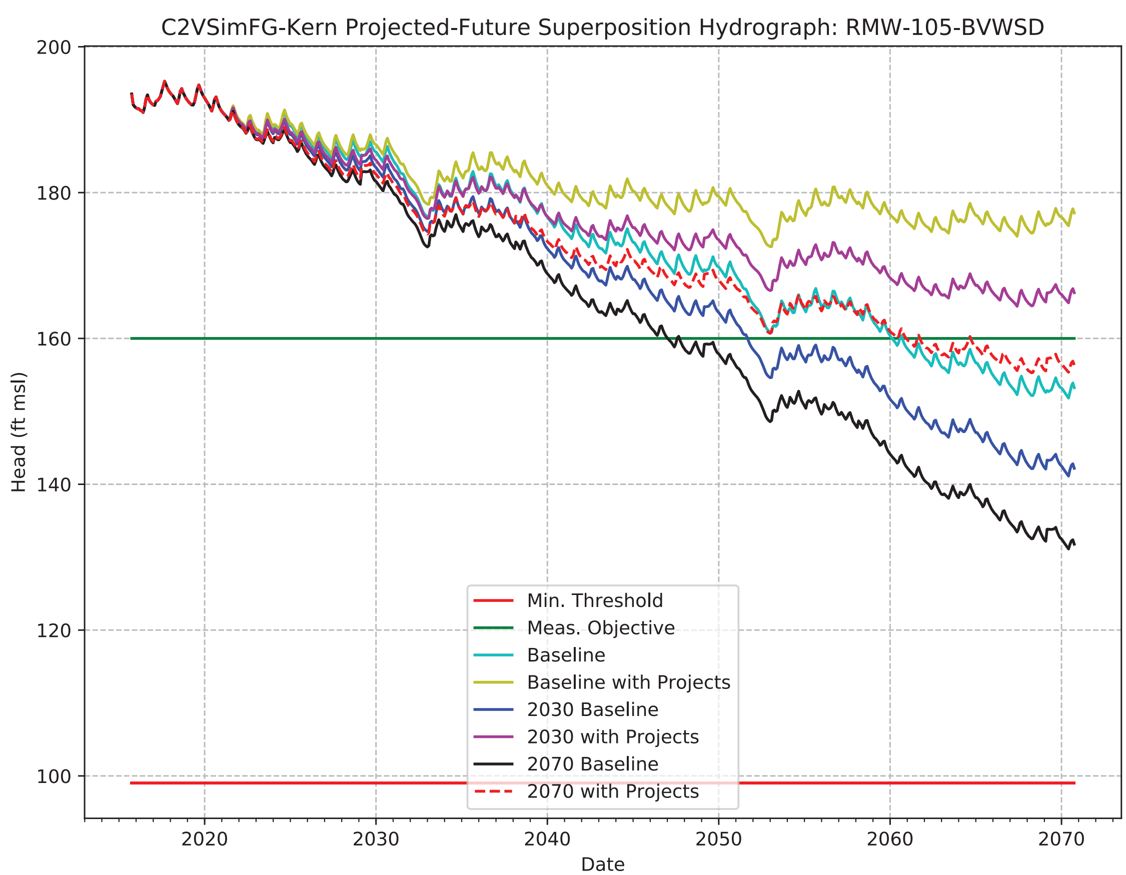
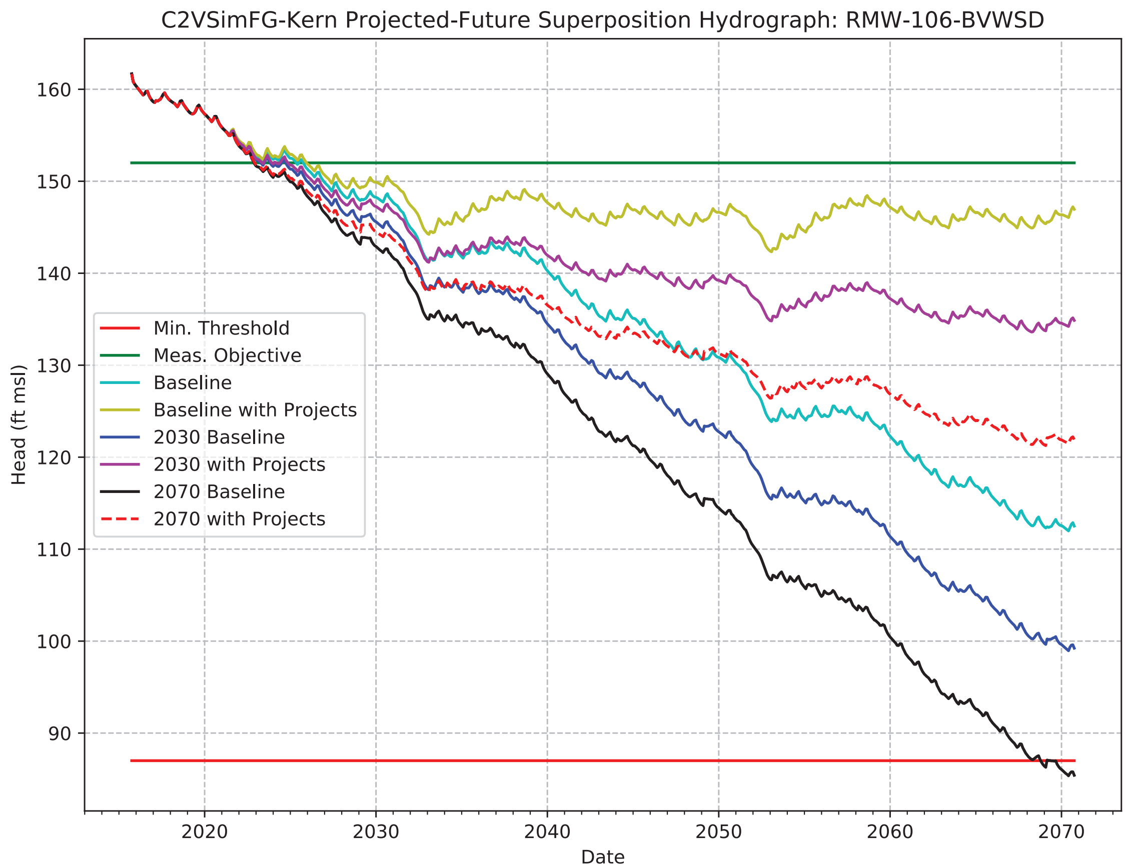
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-105-BVWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
100
120
140
160
180
200
2020
2030
2040
2050
2060
2070



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-106-BVWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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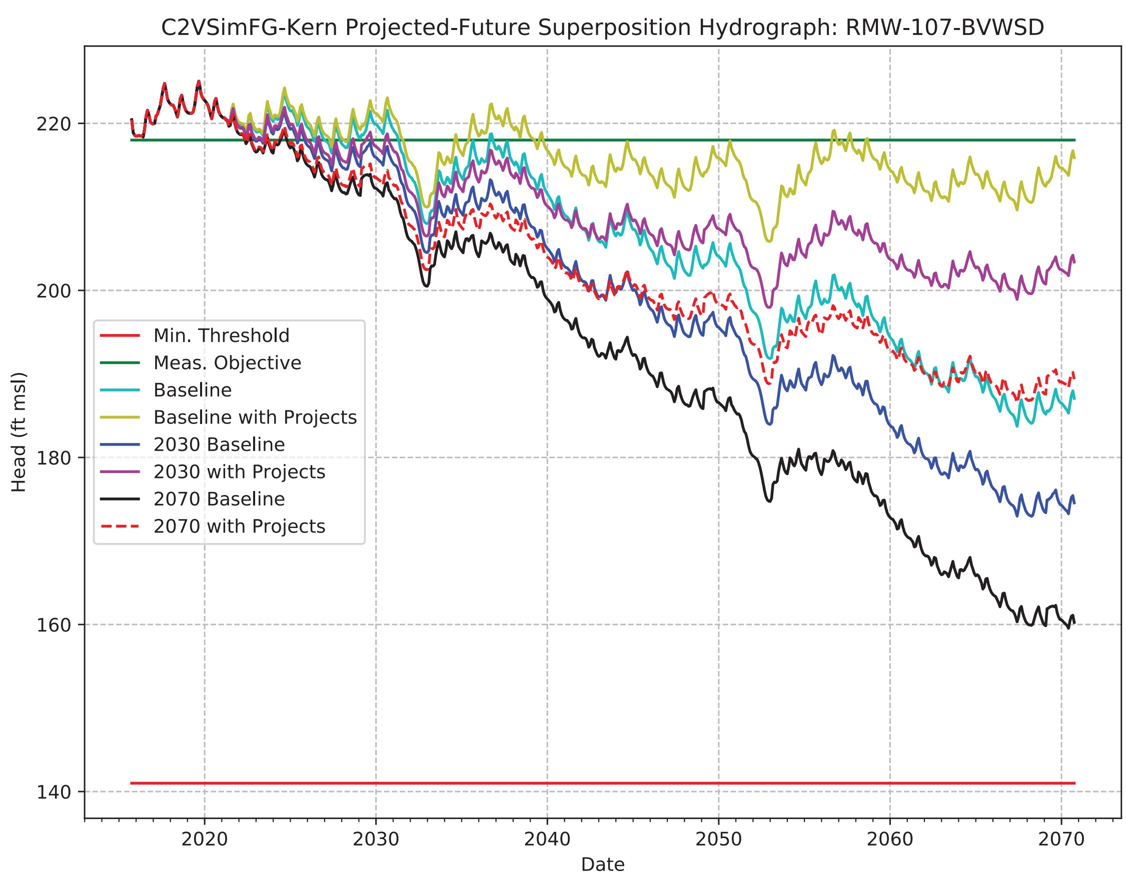
2030 with Projects
2070 Baseline
2070 with Projects

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-107-BVWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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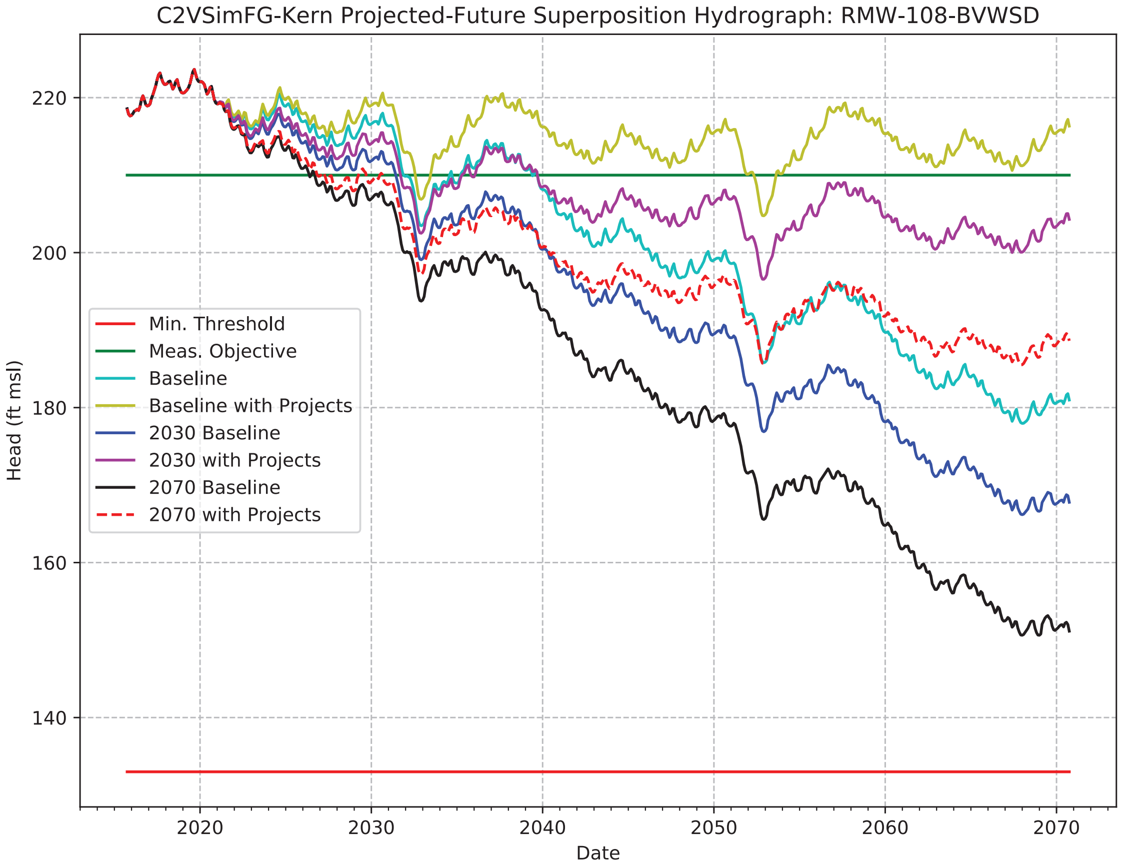
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-108-BVWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
220
200
180
160
140
2020
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2040
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2060
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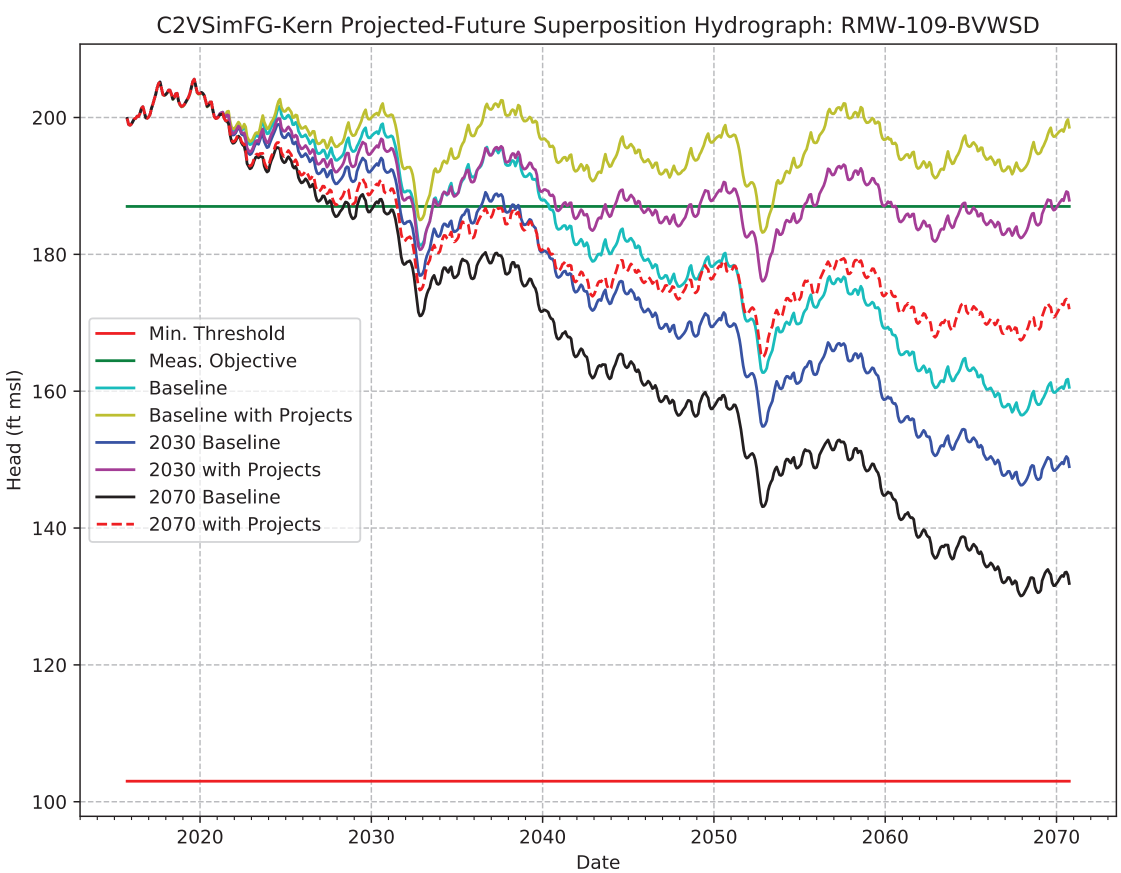
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-109-BVWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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2030 with Projects
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2070 with Projects
200
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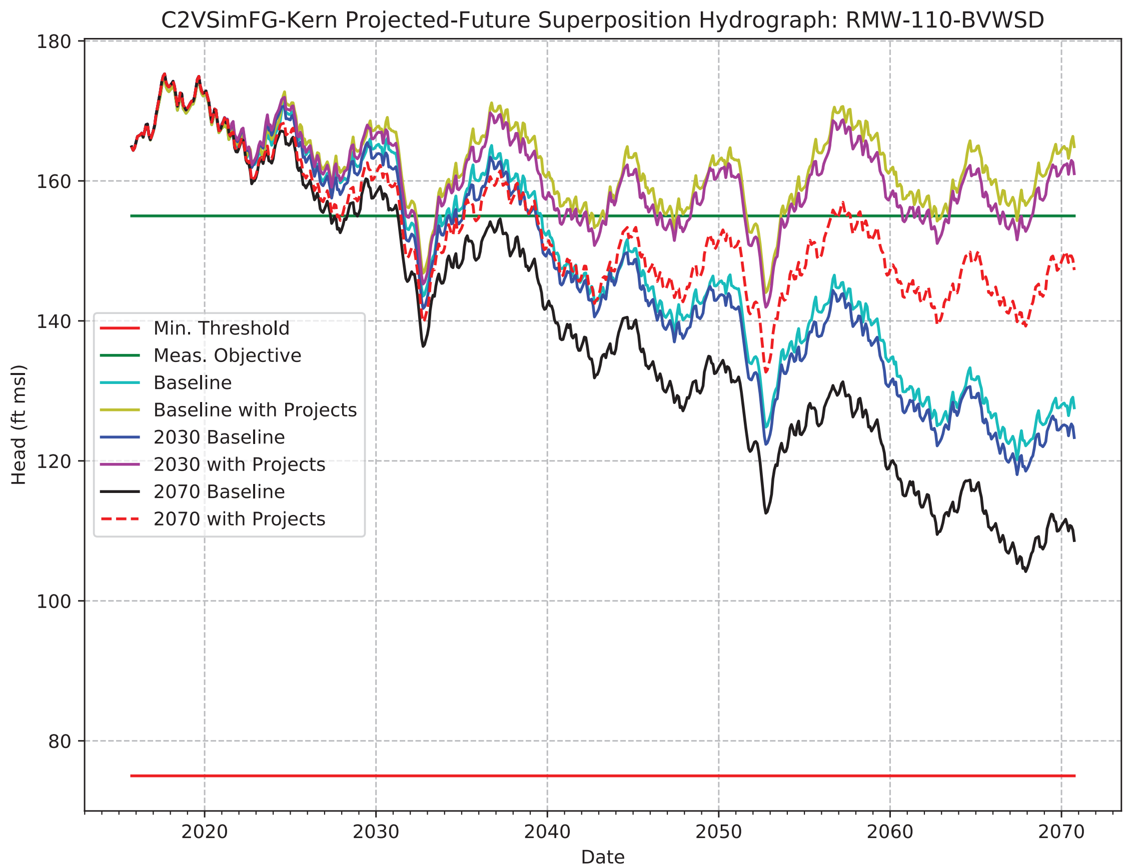

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-110-BVWSD
Head (ft msl)
180
160
140
120
100
80
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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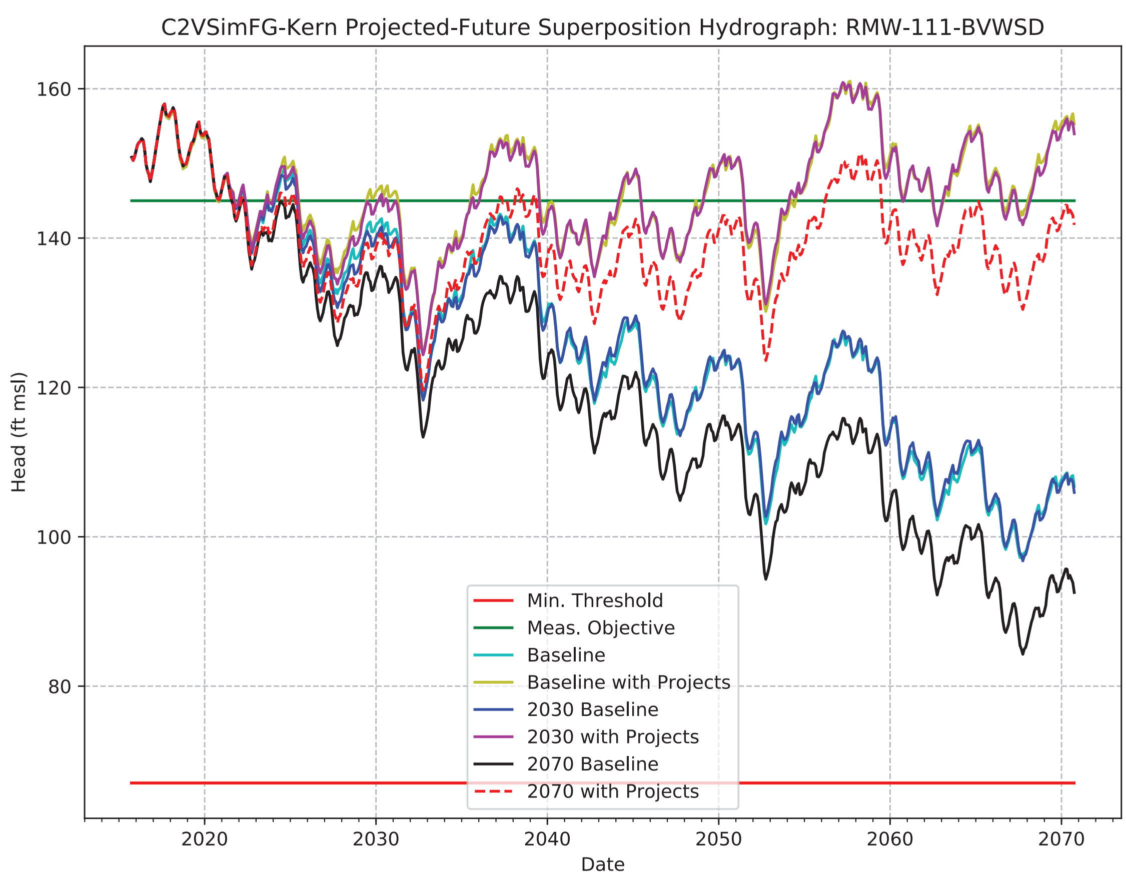
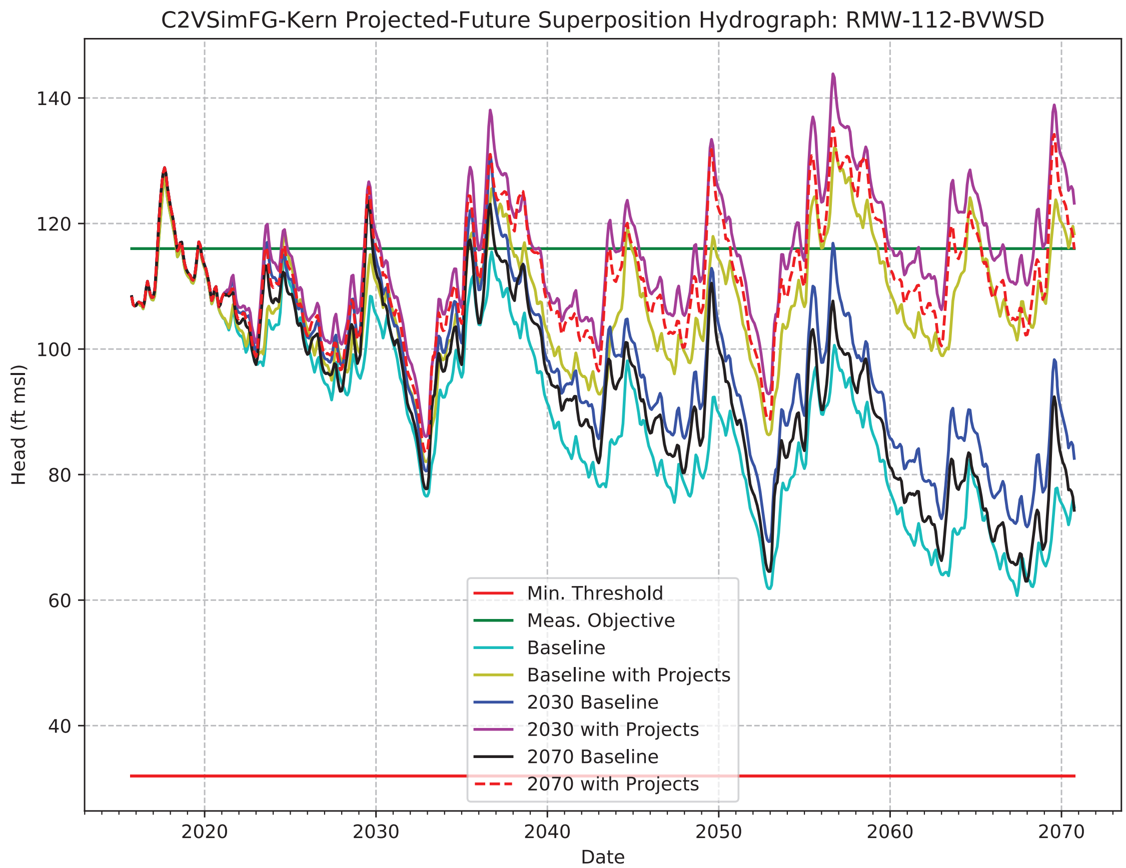
2070 with Projects

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-111-BVWSD
Head (ft msl)
160
140
120
100
80
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-112-BVWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
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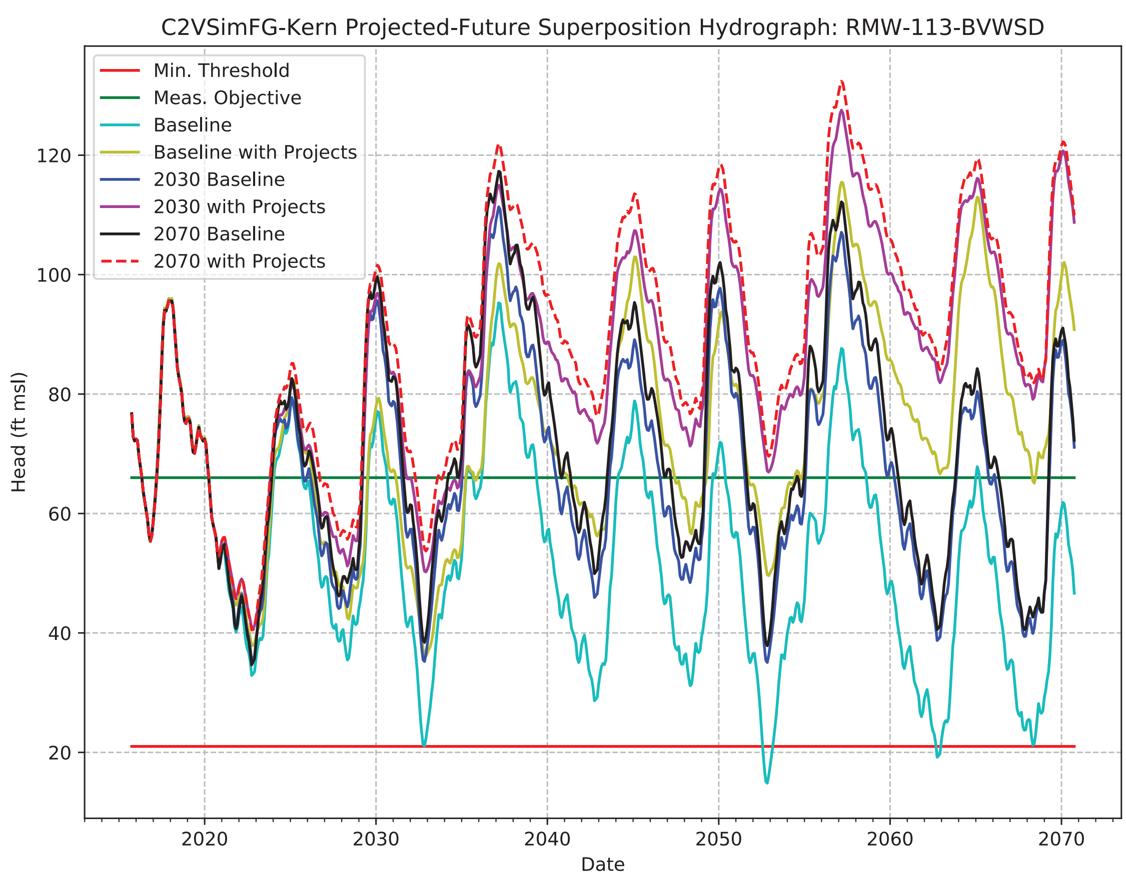
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-113-BVWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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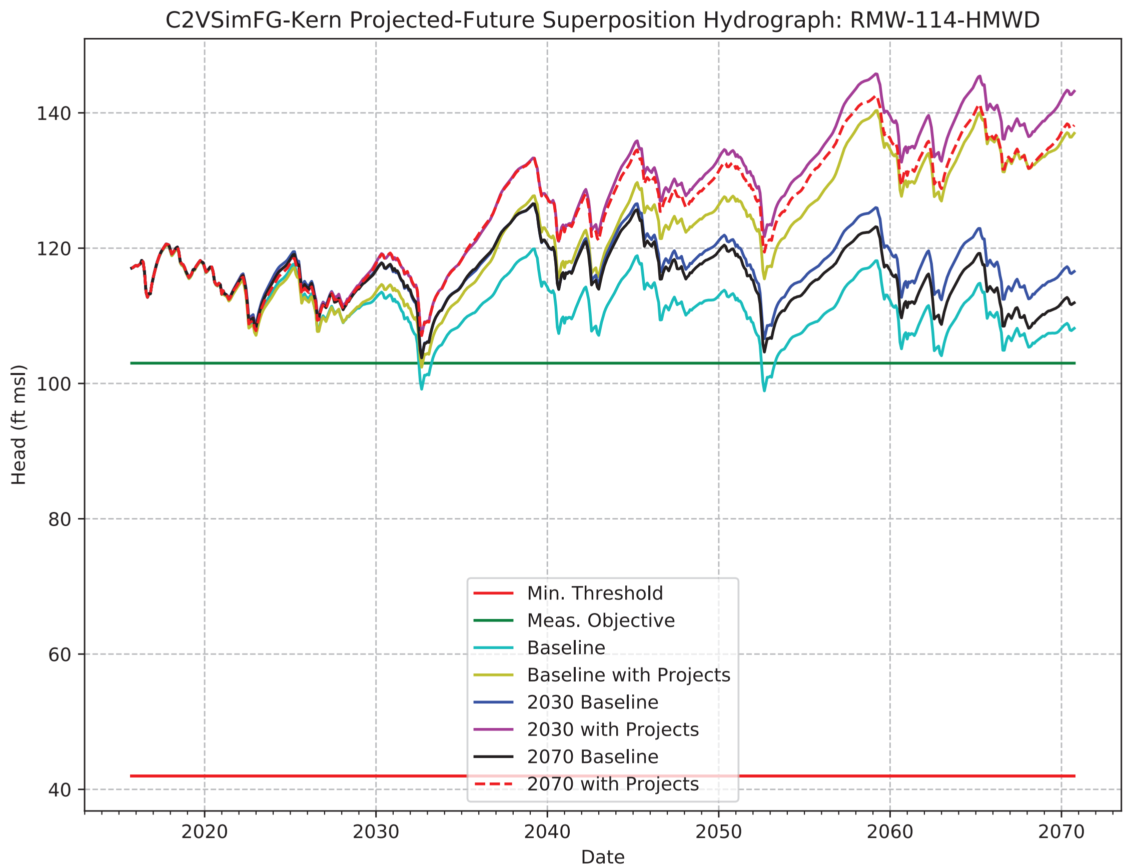
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-114-HMWD
Head (ft msl)
140
120
100
80
60
40
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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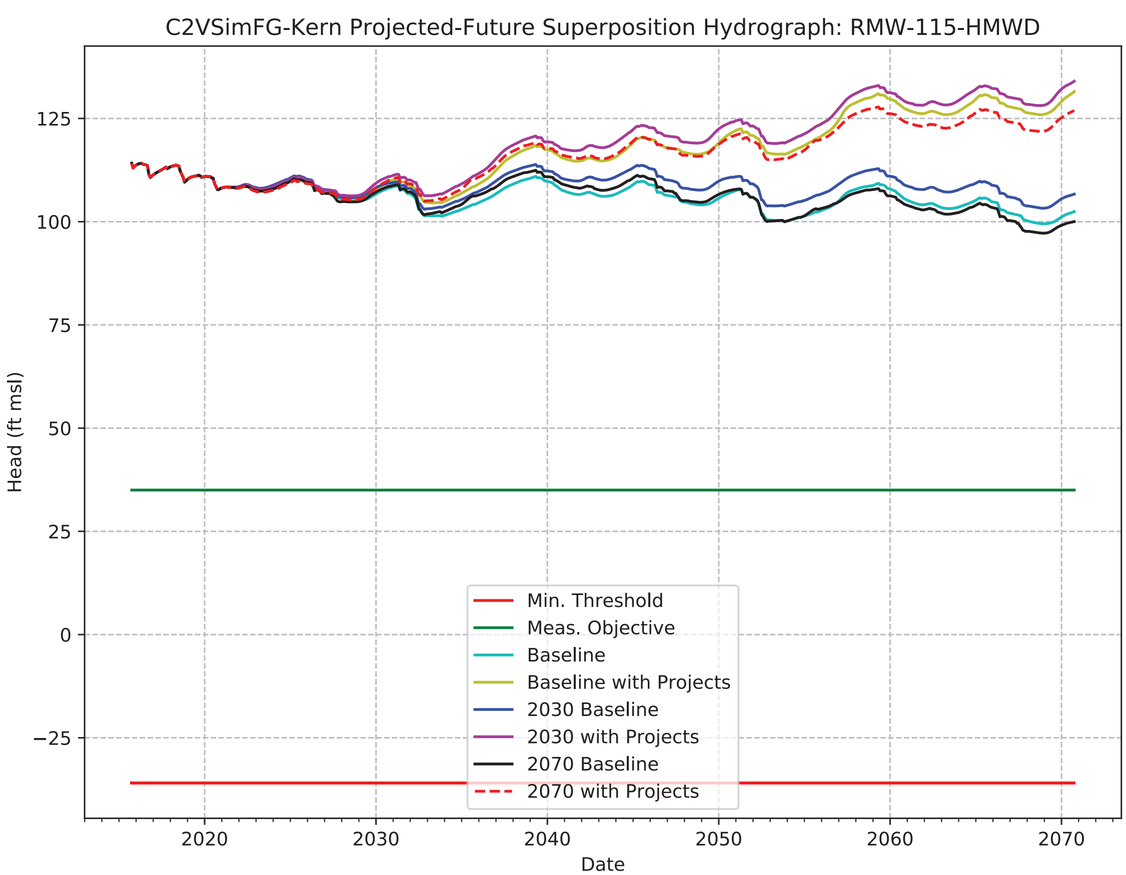
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-115-HMWD
Head (ft msl)
125
100
75
50
25
0
−25
2020
2030
2040
2050
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2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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2030 with Projects
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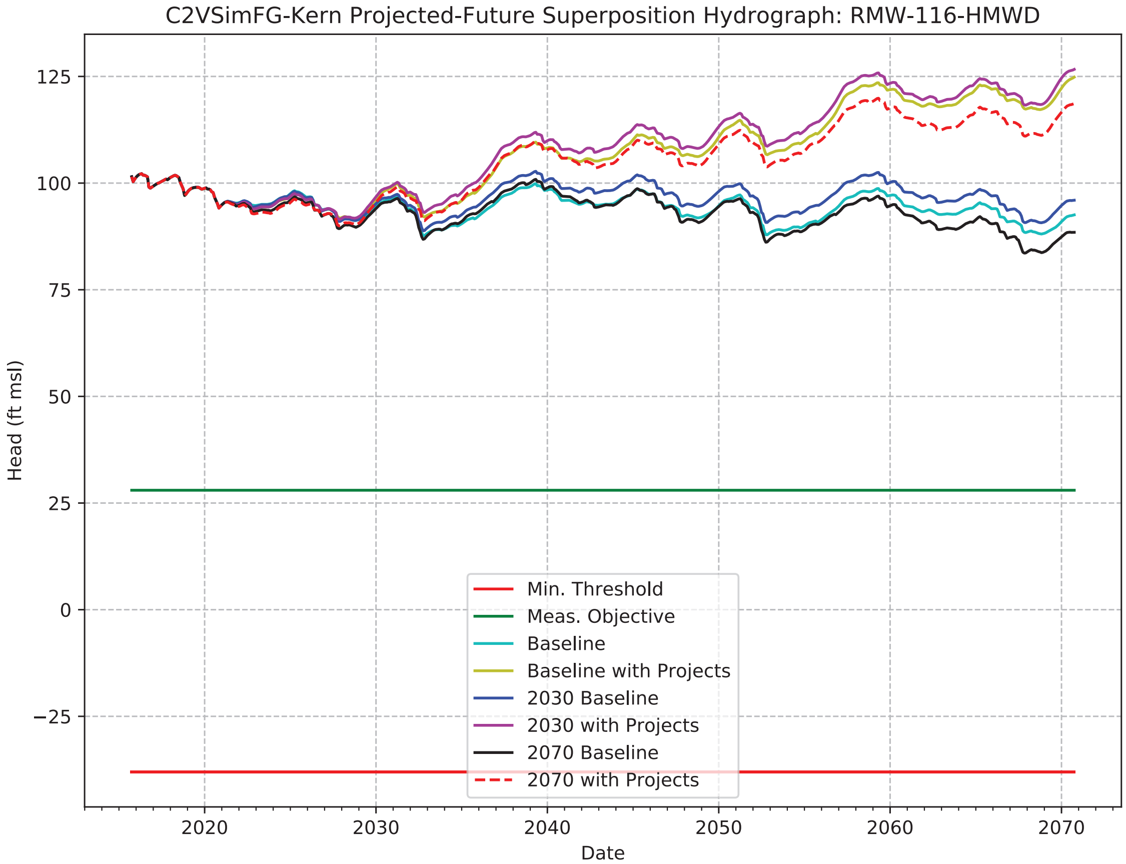
2070 with Projects



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-116-HMWD
Head (ft msl)
Date
125
100
75
50
25
0
−25
2020
2030
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2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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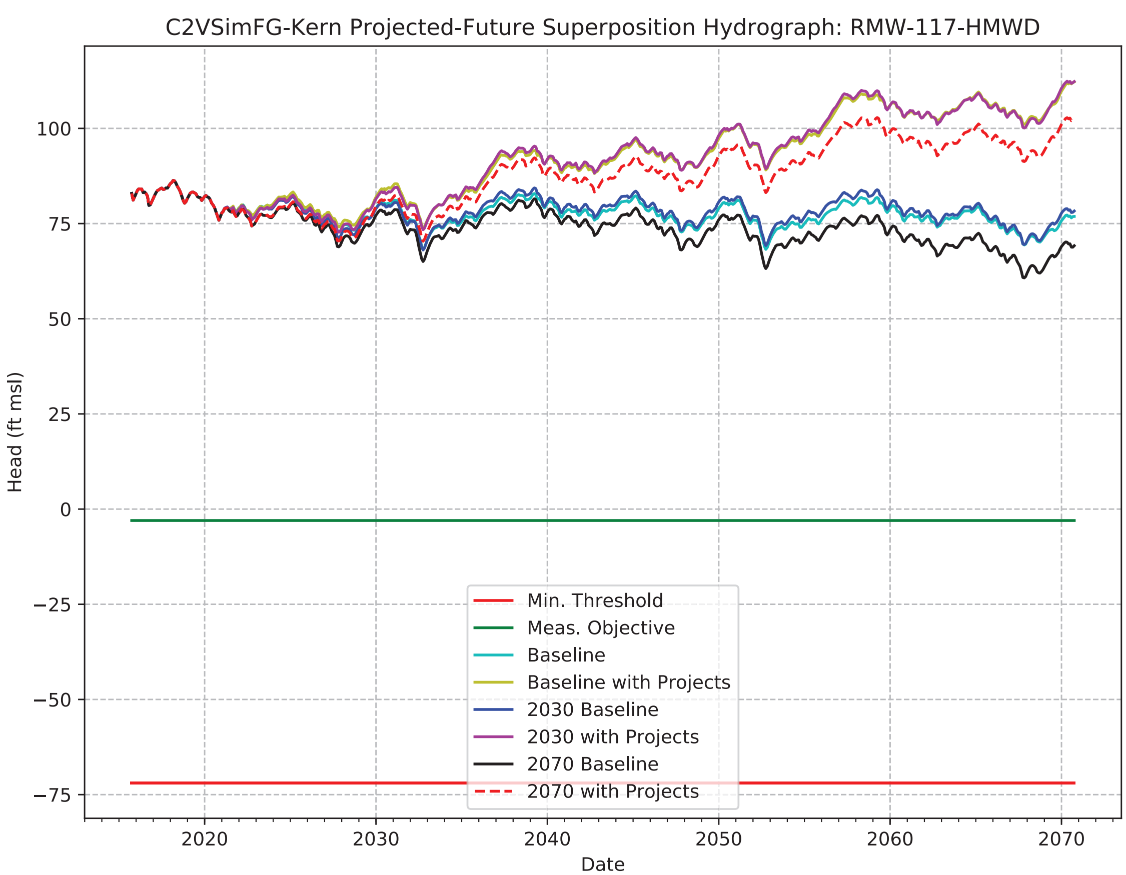
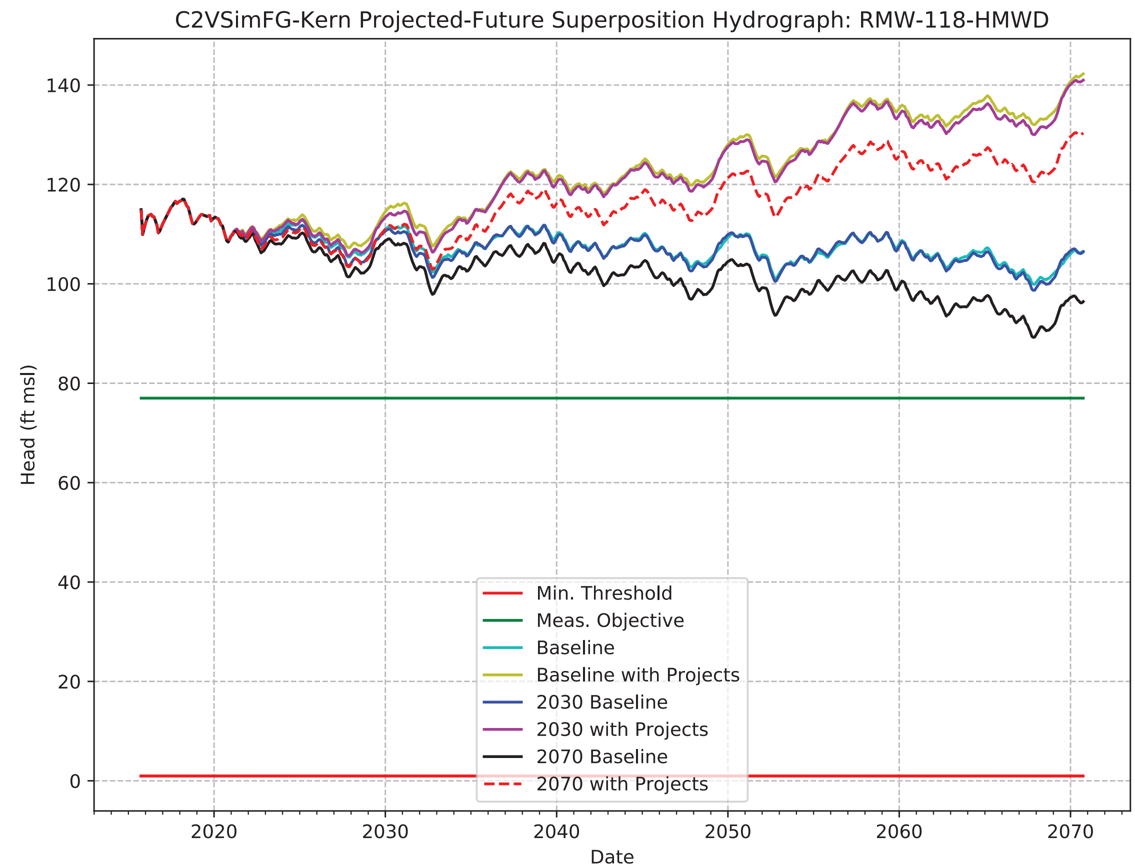
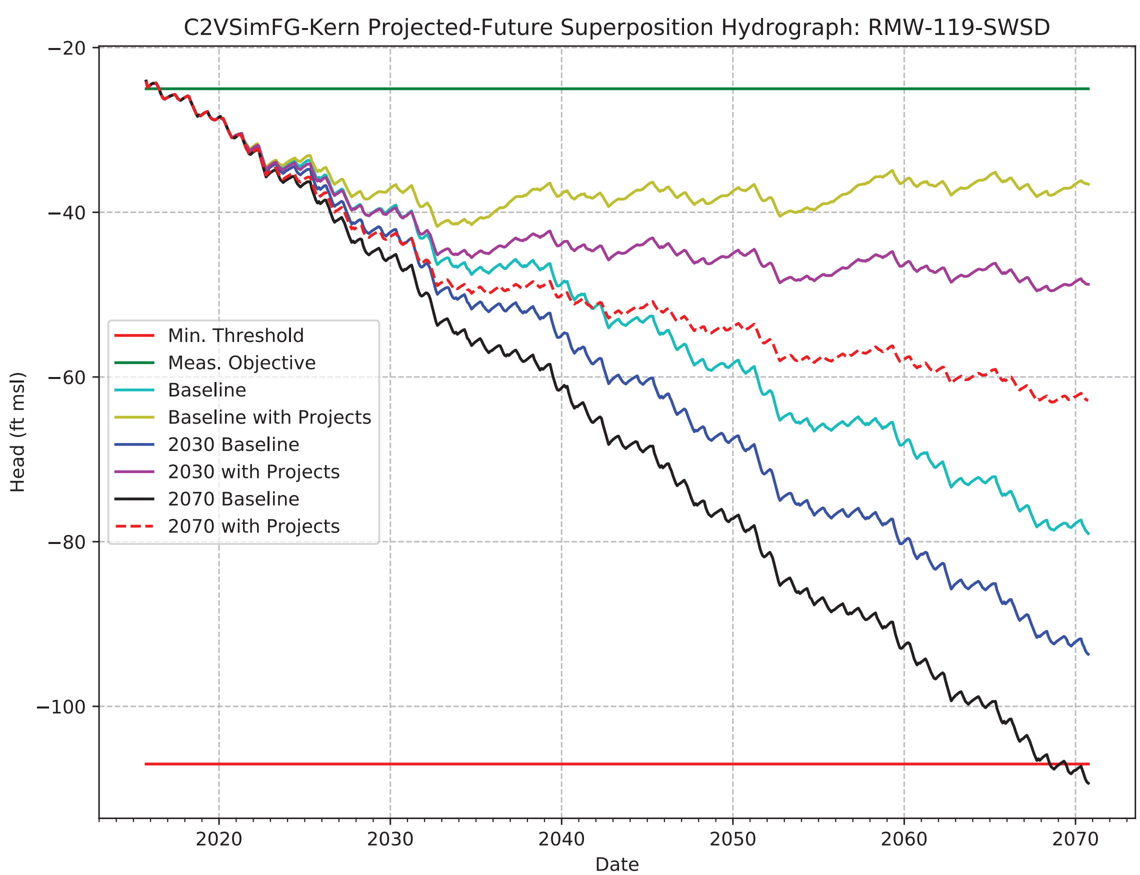
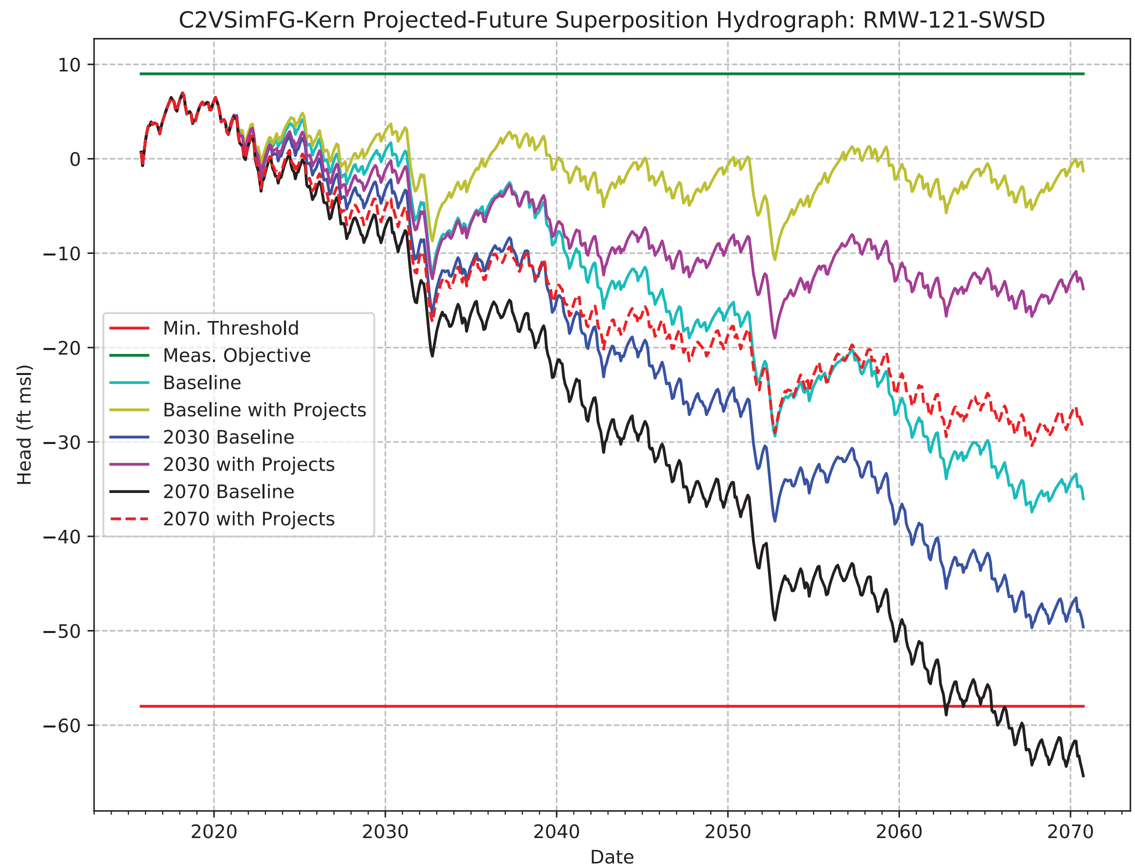
2030 with Projects
2070 Baseline
2070 with Projects

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-117-HMWD
Head (ft msl)
Date
100
75
50
25
0
−25
−50
−75
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-118-HMWD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-119-SWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-121-SWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
10
0
−10
−20
−30
−40
−50
−60
2020
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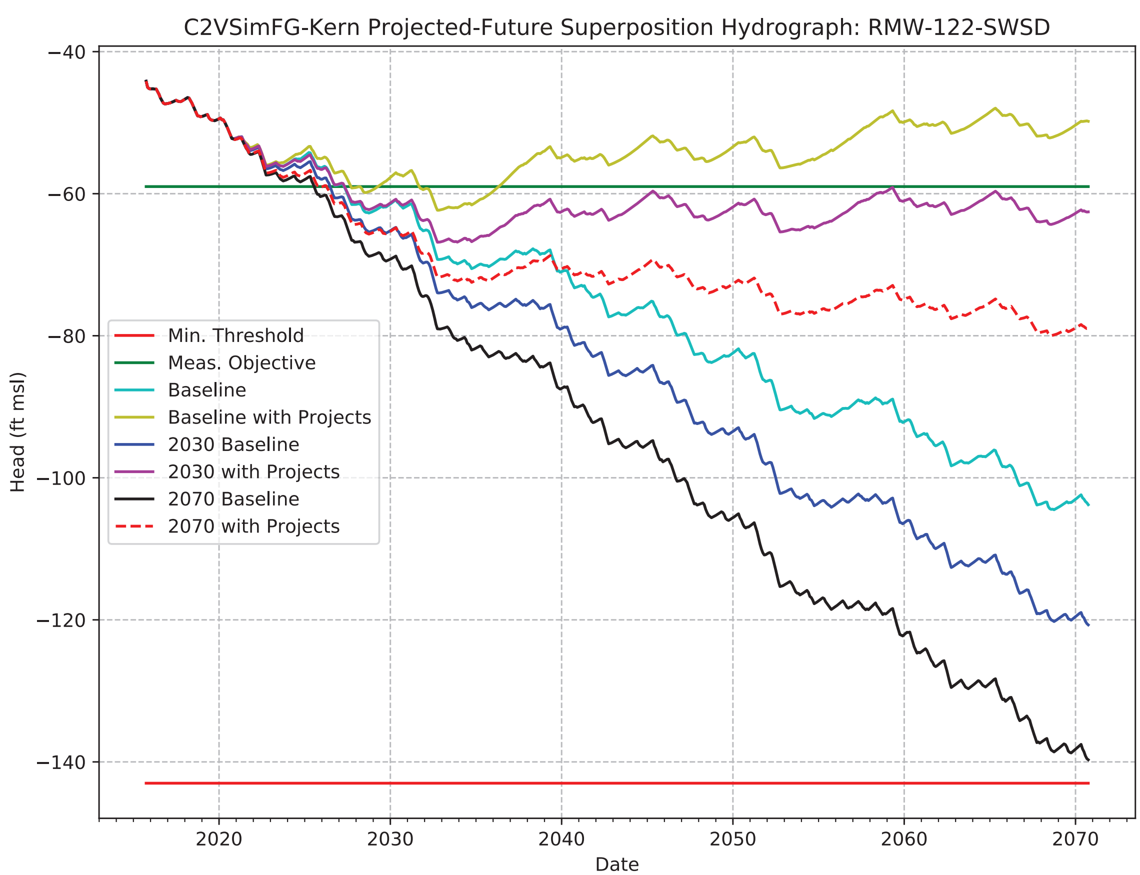
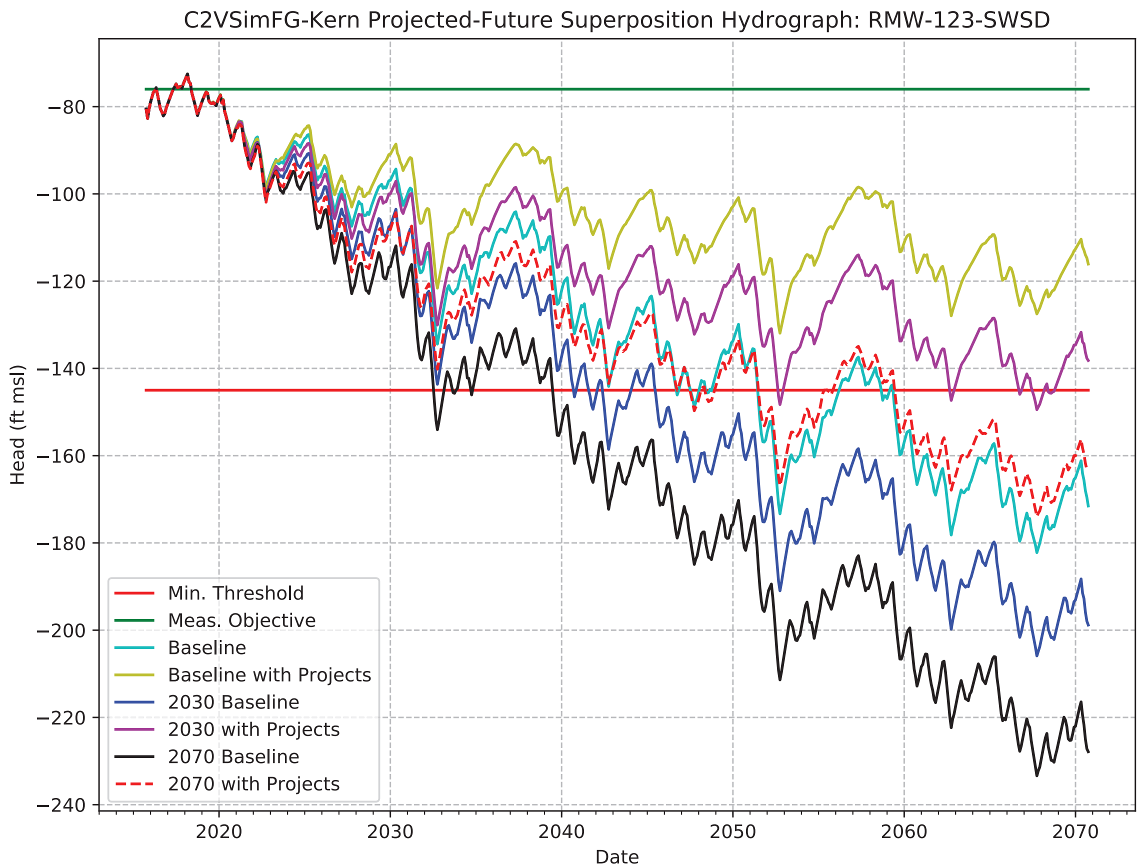
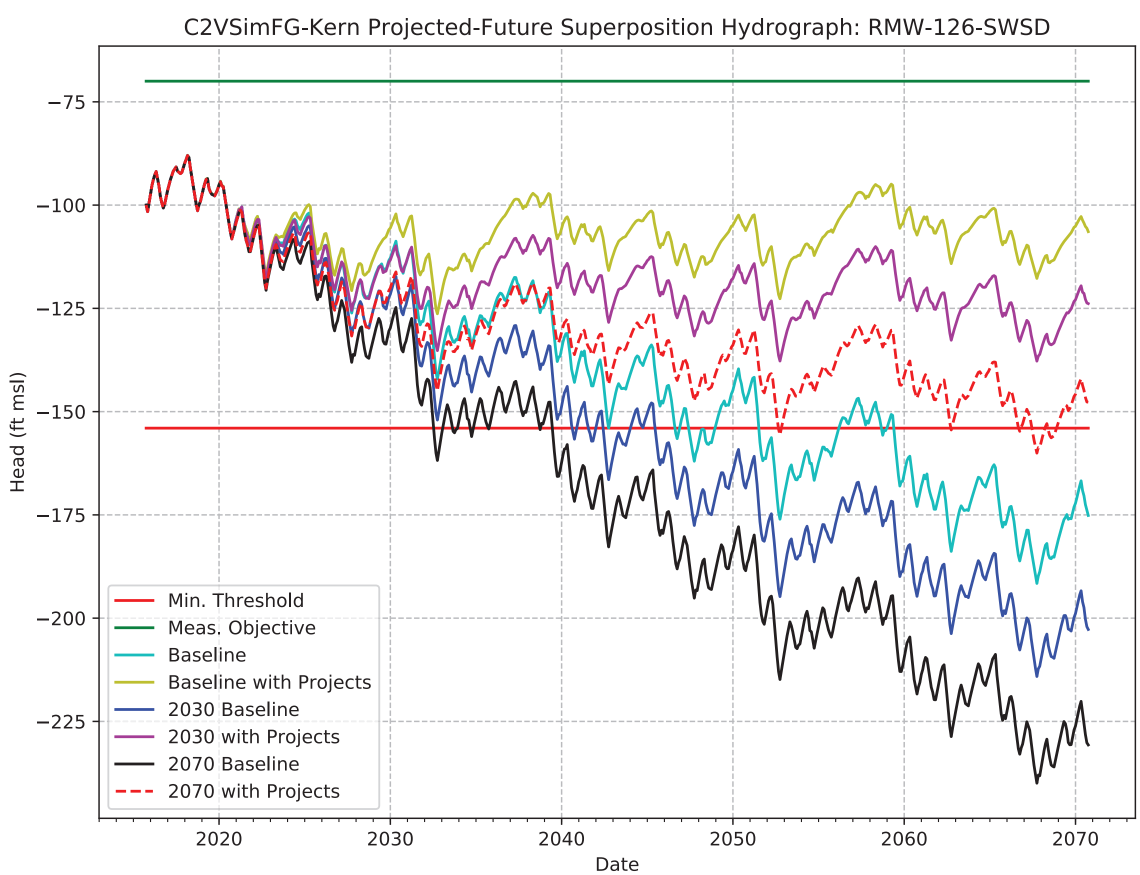
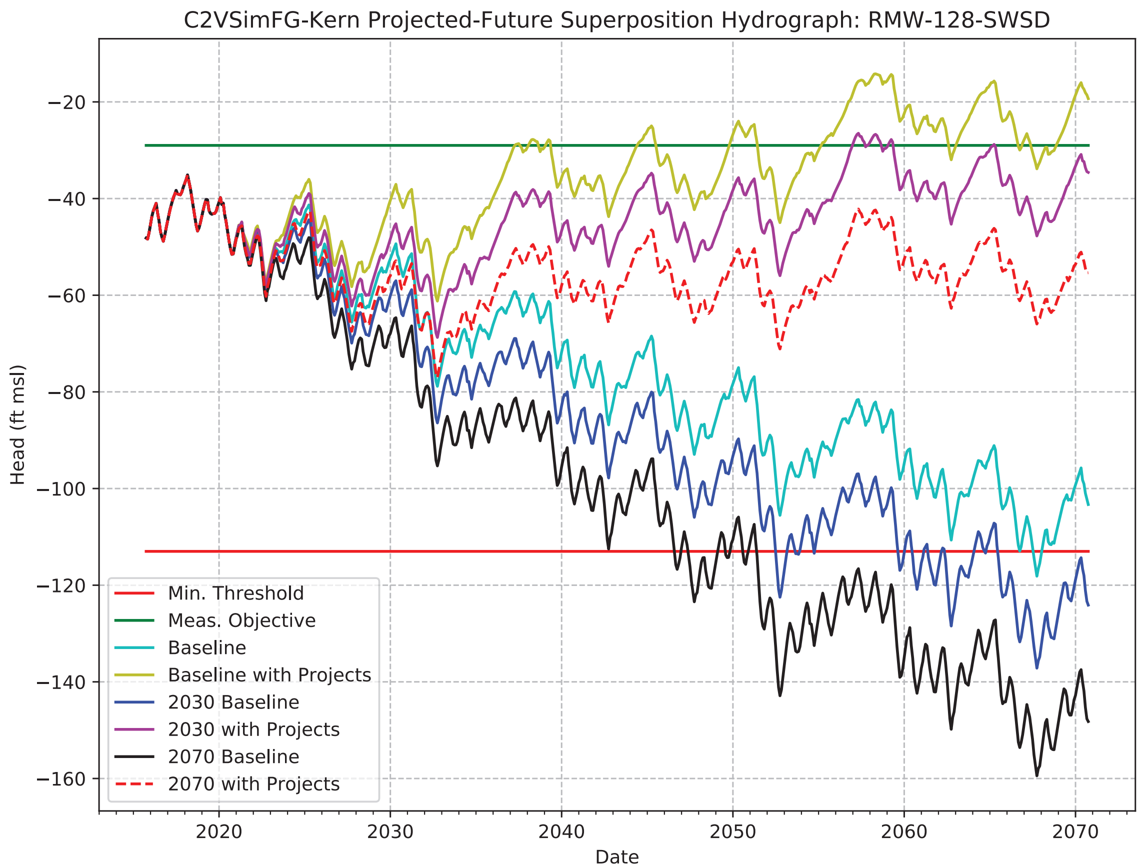
2040
2050
2060
2070

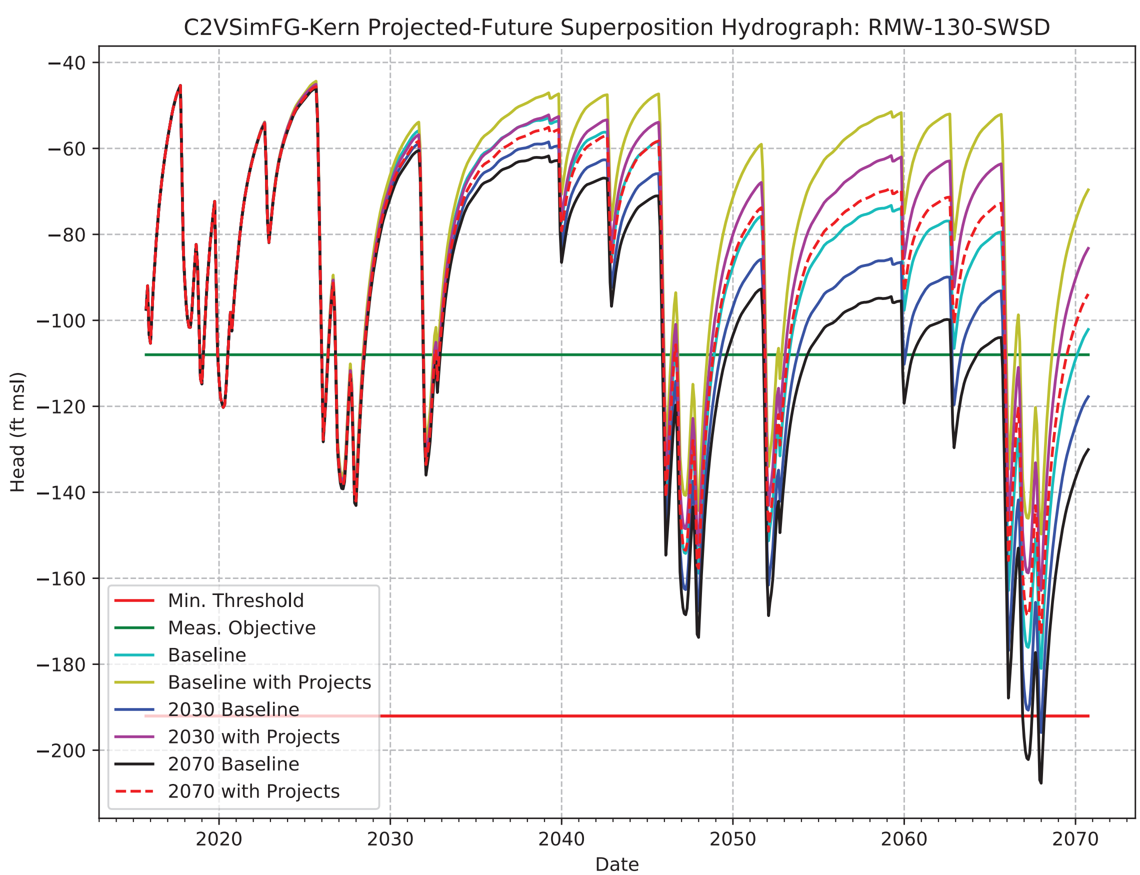



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-122-SWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
−40
−60
−80
−100
−120
−140
2020
2030
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-123-SWSD
Head (ft msl)
−80
−100
−120
−140
−160
−180
−200
−220
−240
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-126-SWSD
Head (ft msl)
−75
−100
−125
−150
−175
−200
−225
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-128-SWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
−20
−40
−60
−80
−100
−120
−140
−160
2020
2030
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-130-SWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
−40
−60
−80
−100
−120
−140
−160
−180
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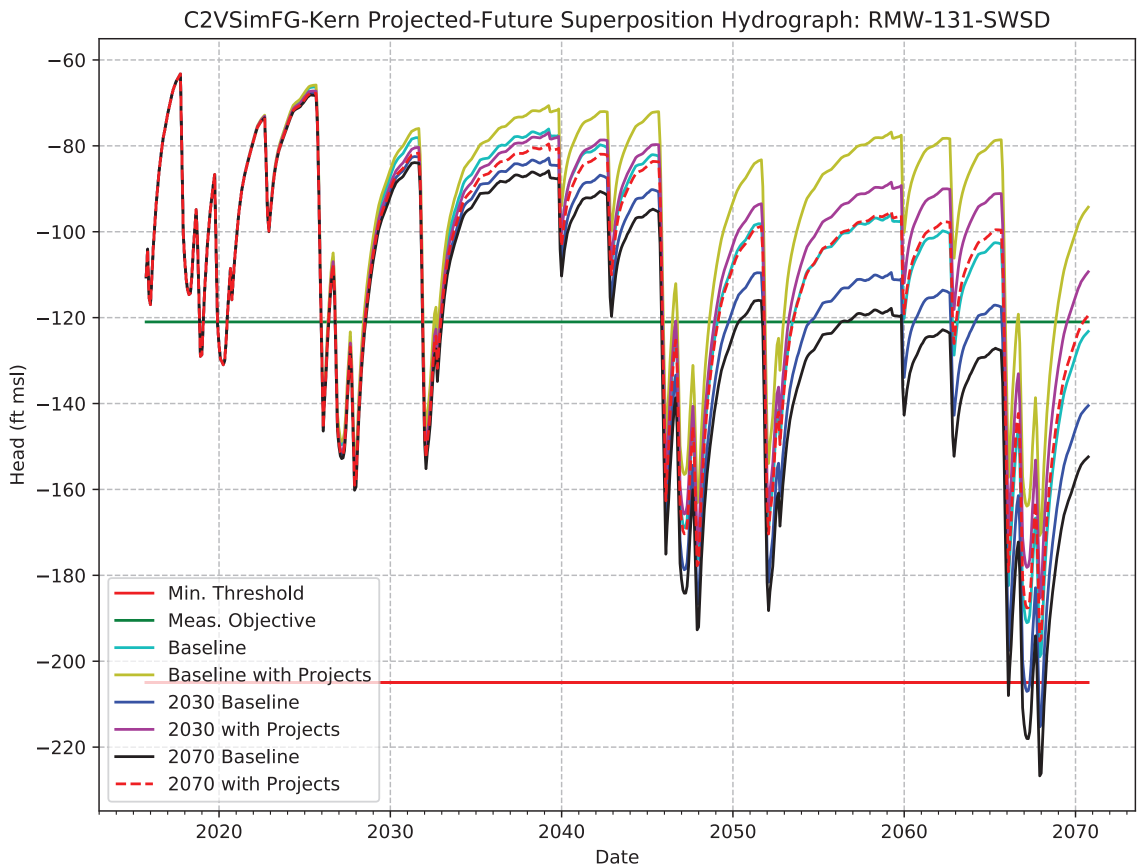
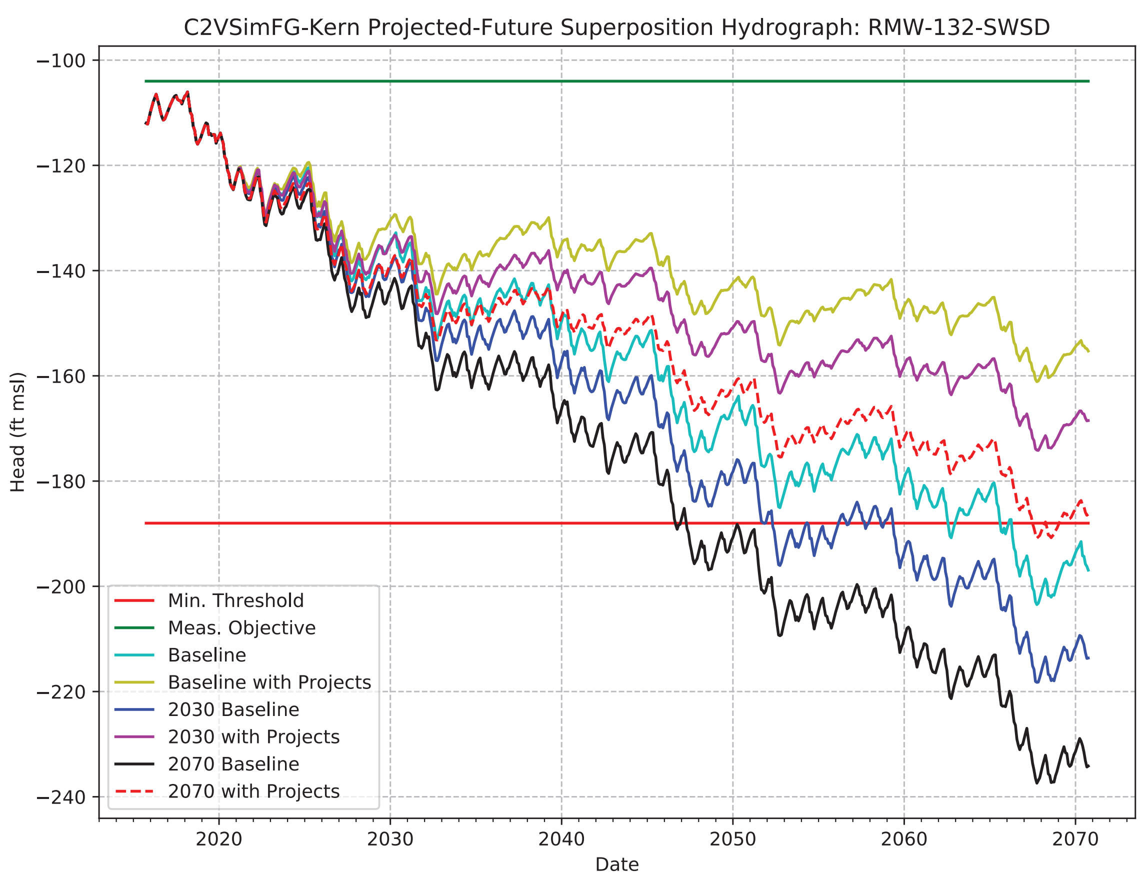
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-131-SWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-132-SWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
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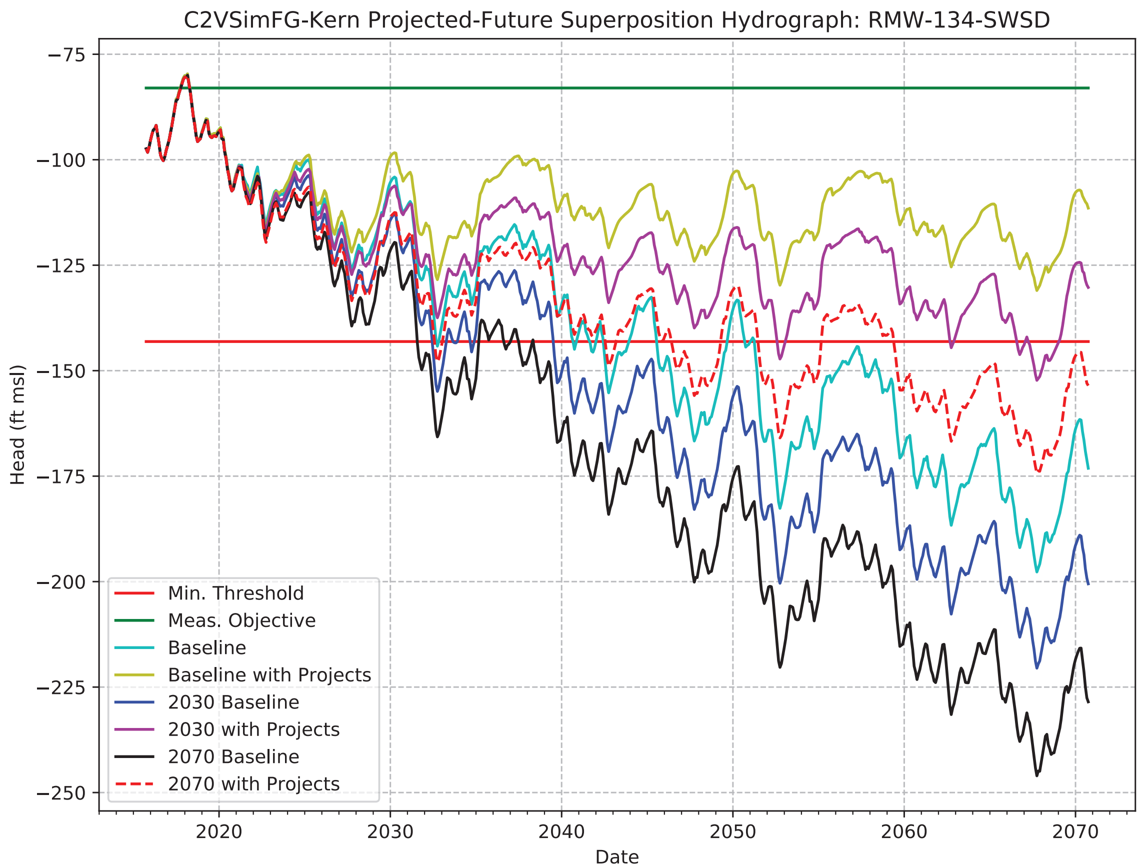
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-134-SWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
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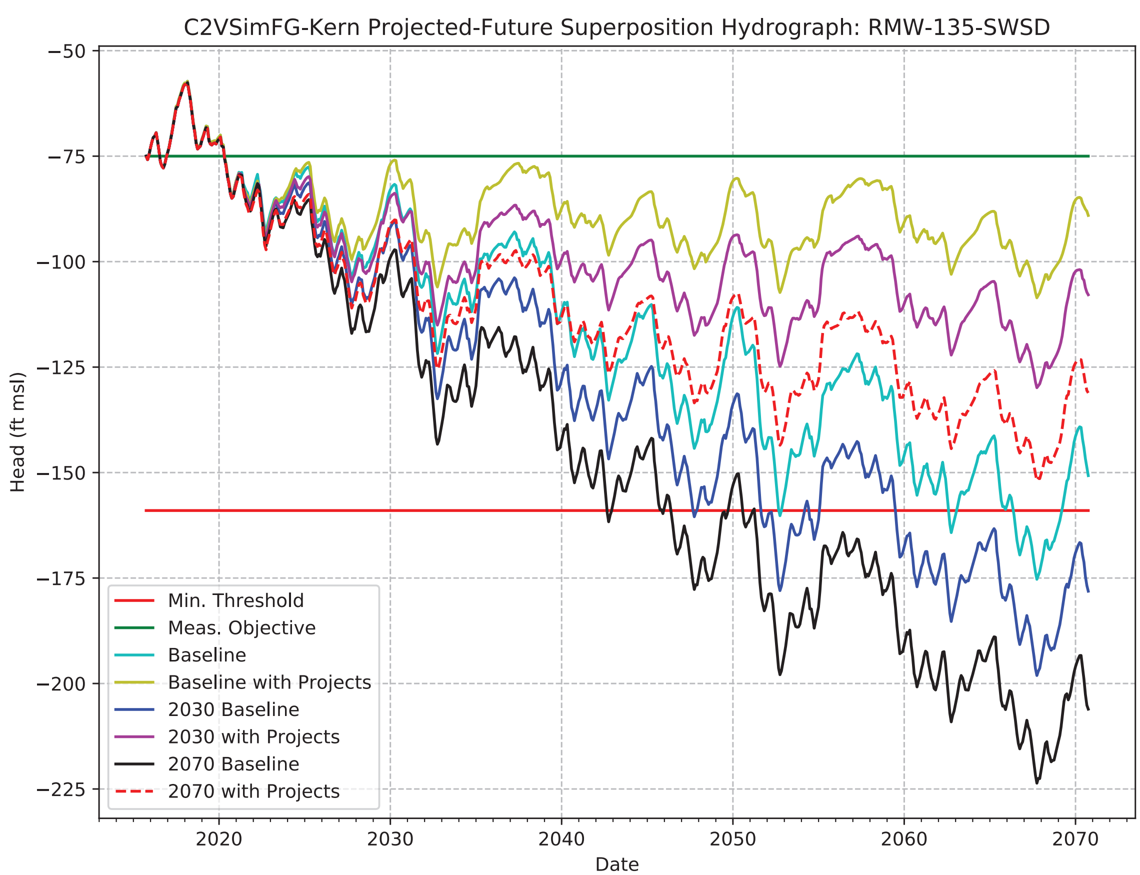
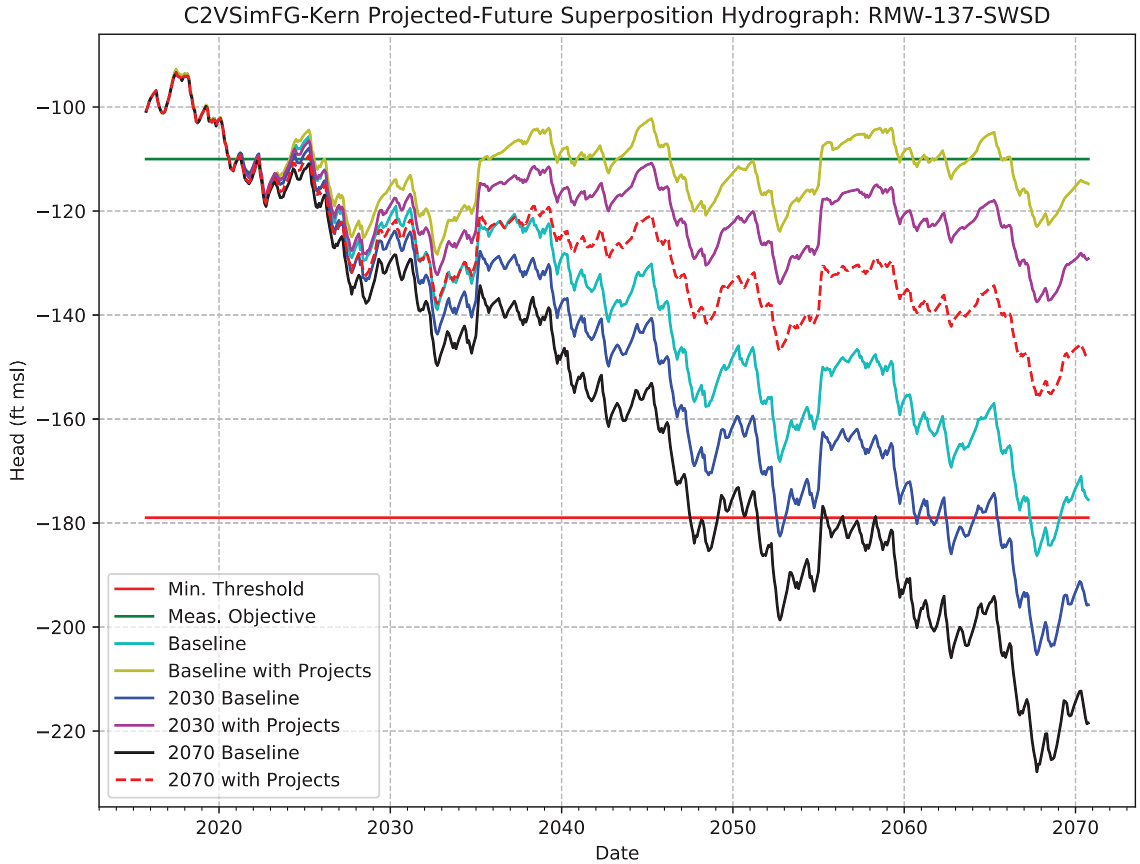
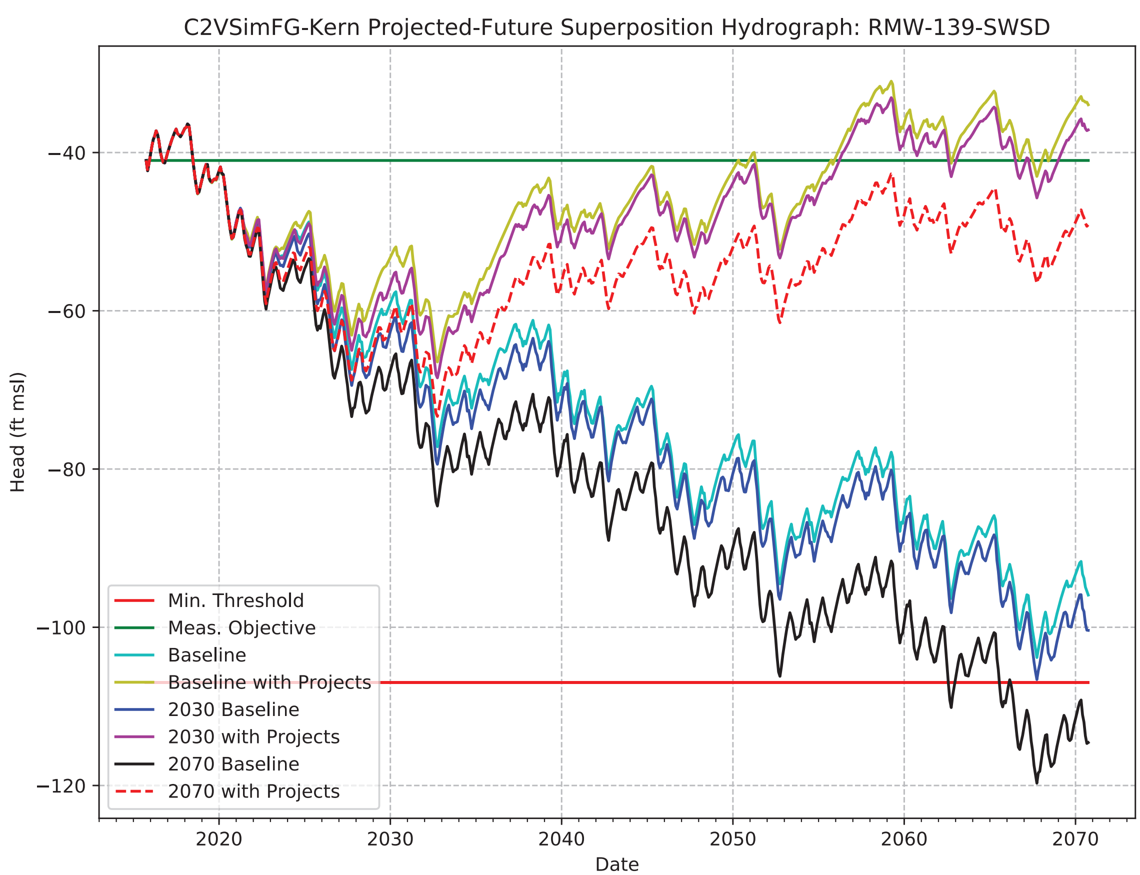
2050
2060
2070

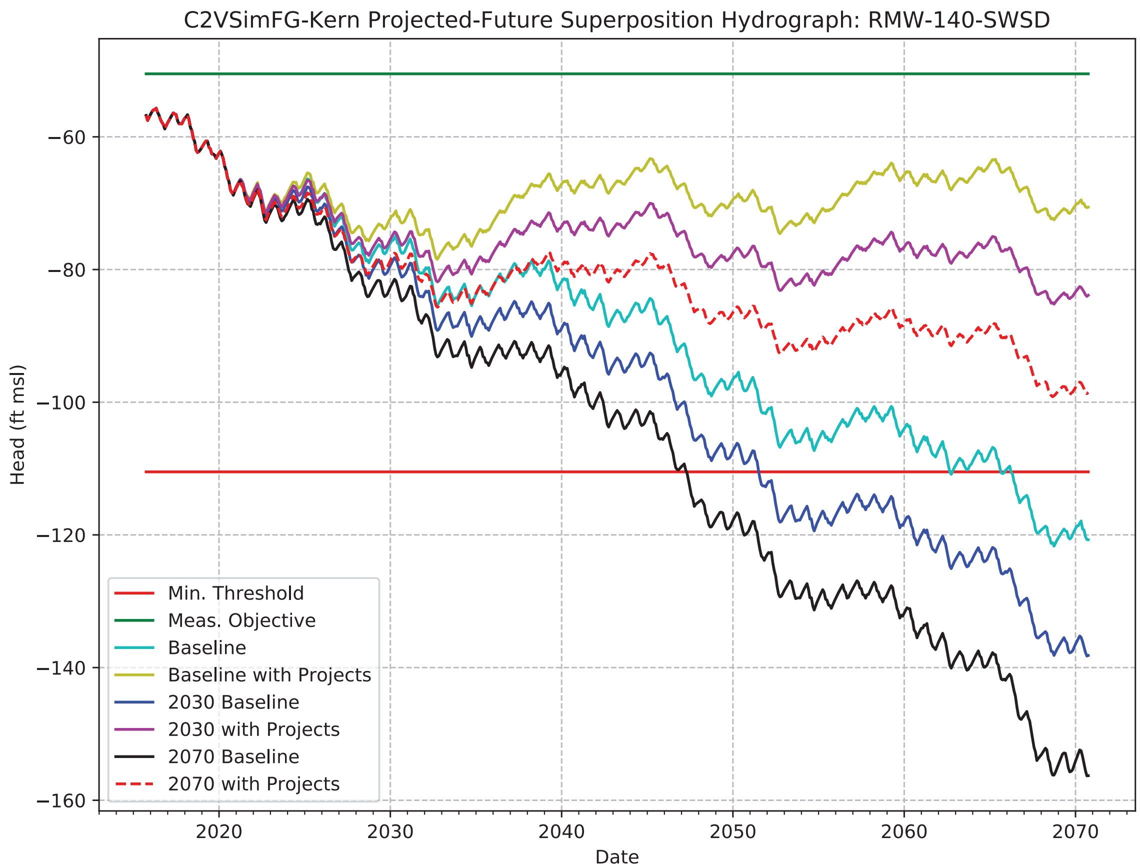

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-135-SWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
−50
−75
−100
−125
−150
−175
−200
−225
2020
2030
2040
2050
2060
2070

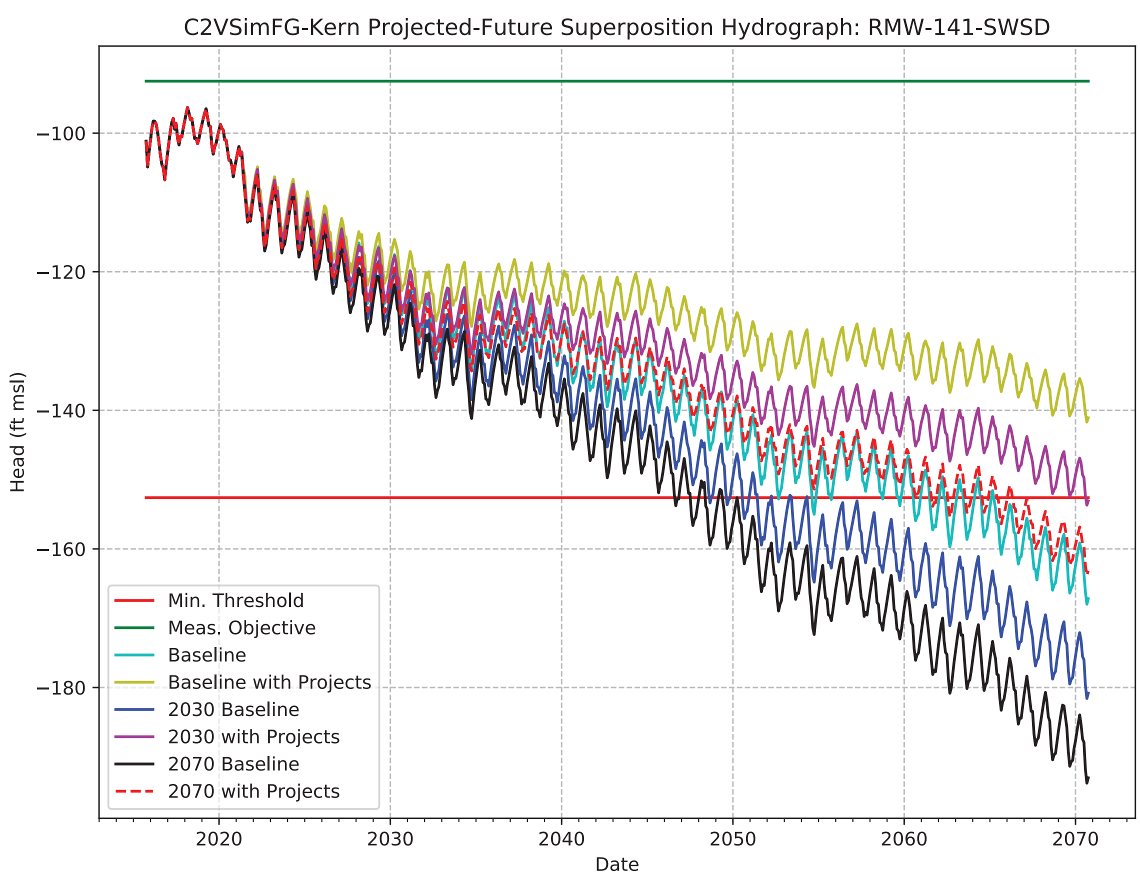


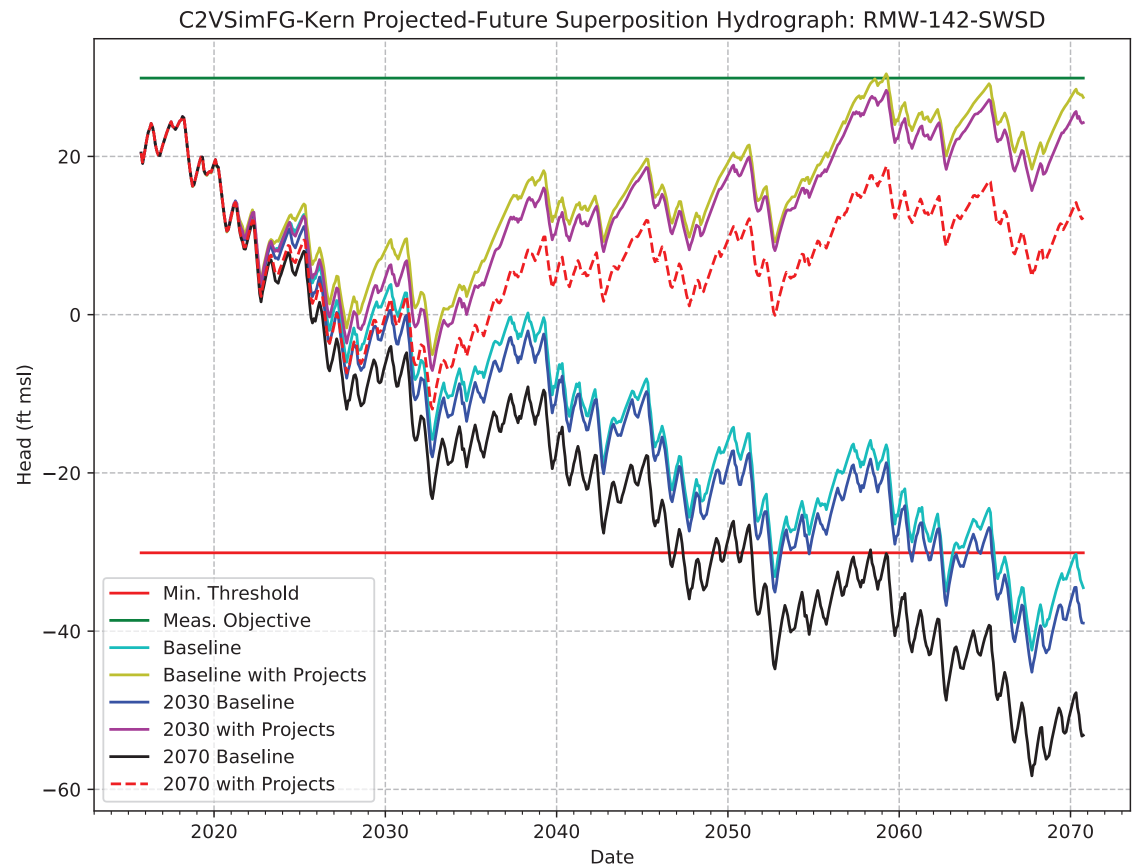
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-137-SWSD
Head (ft msl)
−100
−120
−140
−160
−180
−200
−220
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

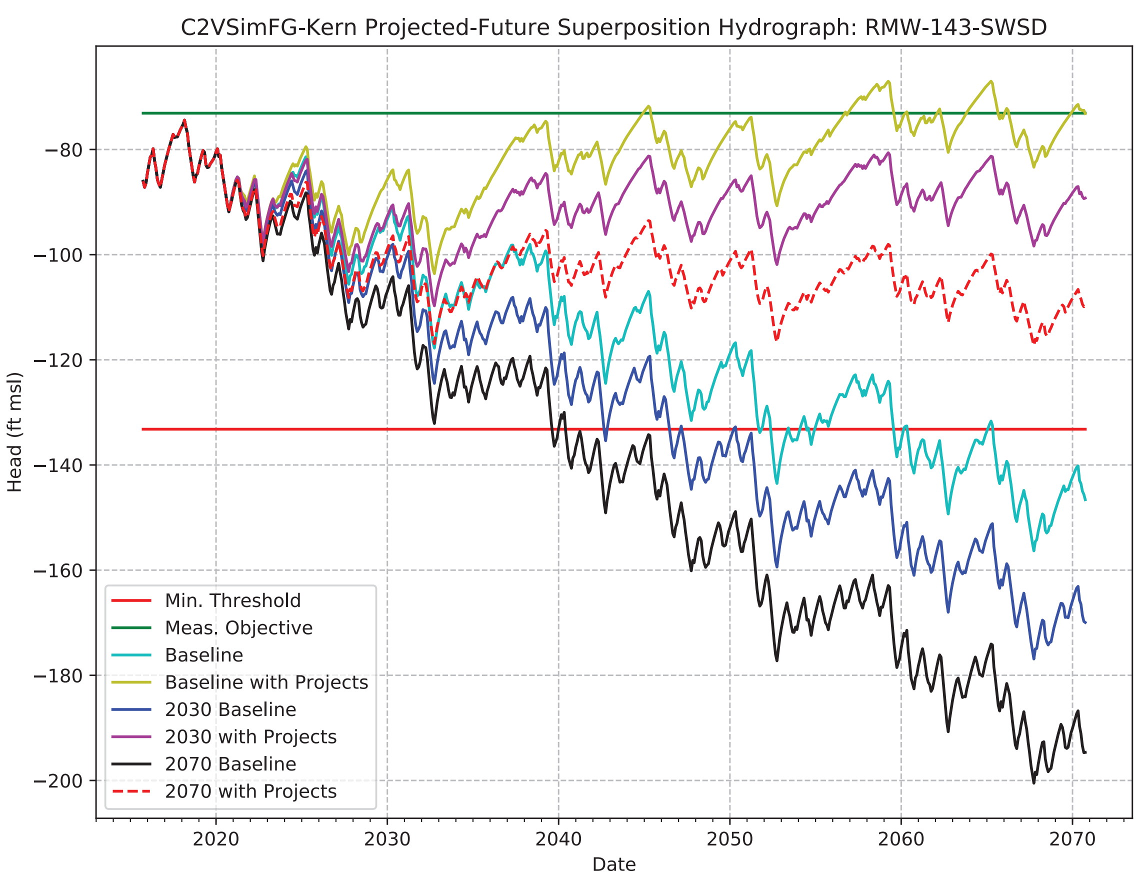
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-139-SWSD
Head (ft msl)
−40
−60
−80
−100
−120
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-140-SWSD
Head (ft msl)
−60
−80
−100
−120
−140
−160
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

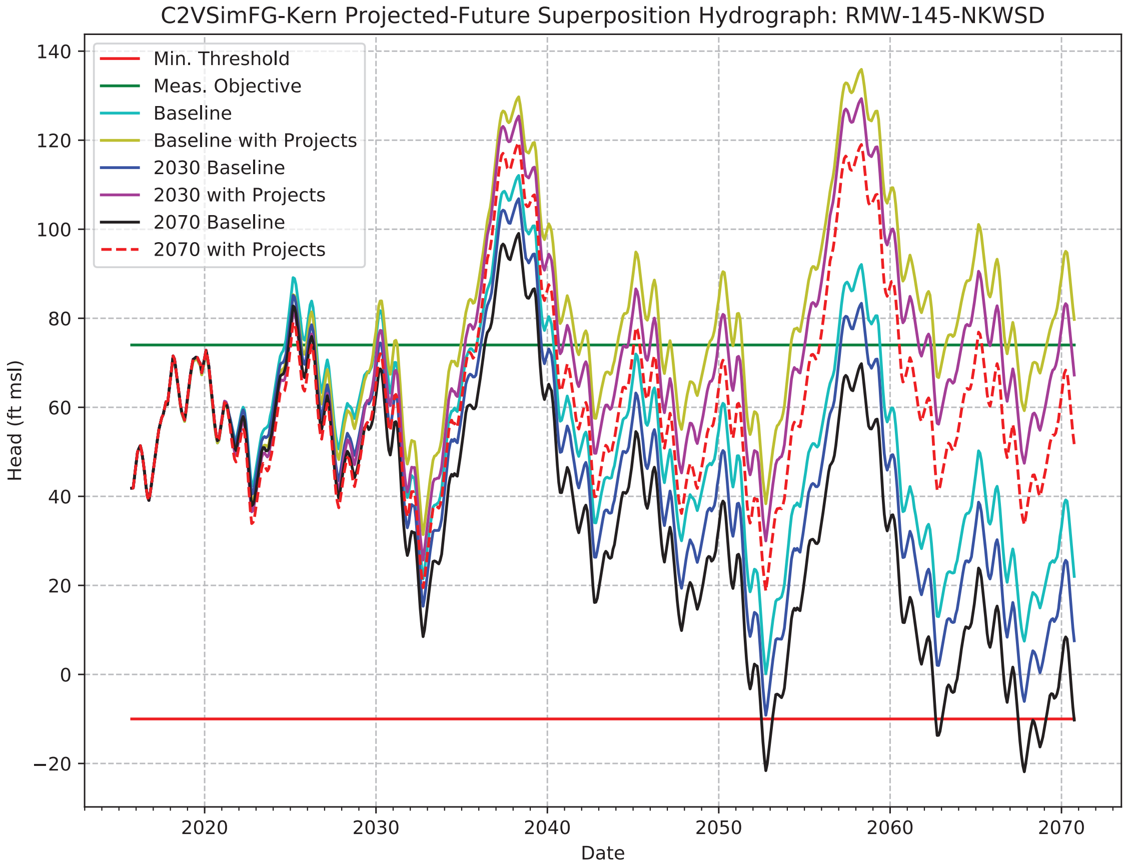

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-141-SWSD
Head (ft msl)
−100
−120
−140
−160
−180
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

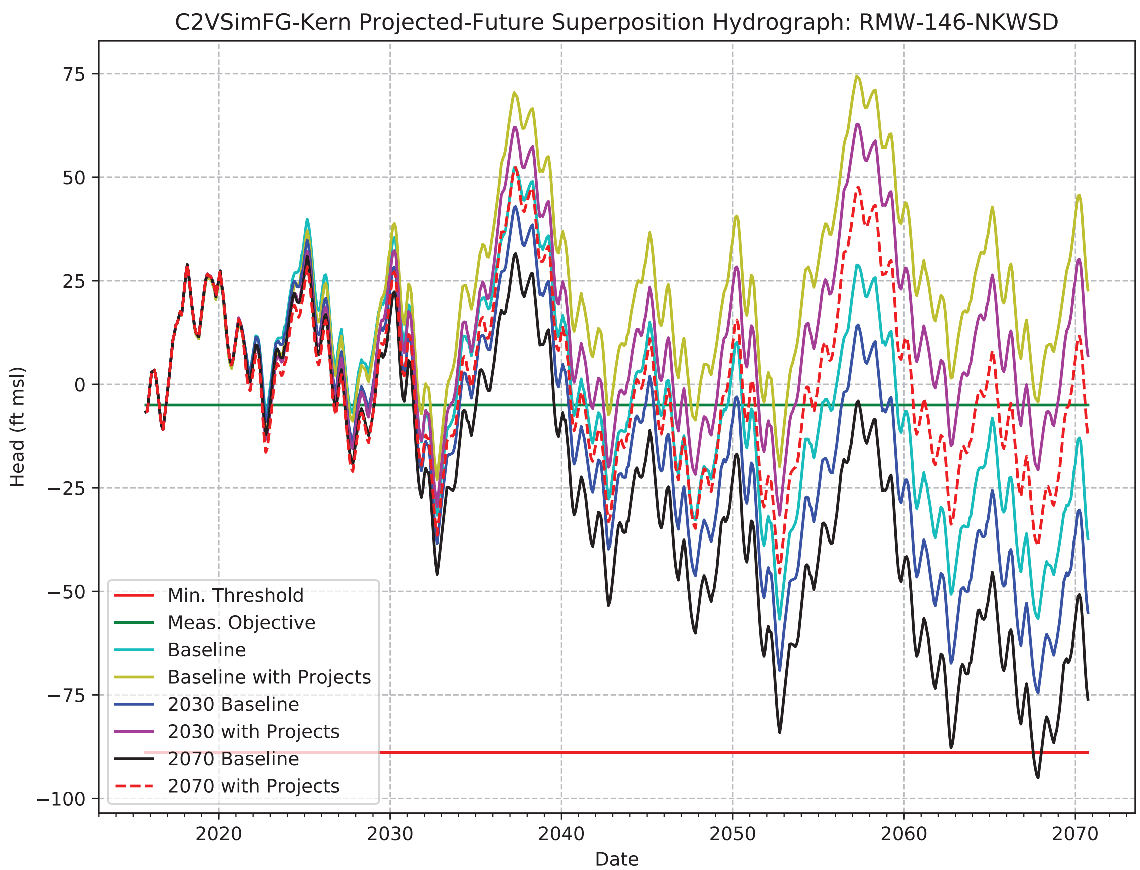


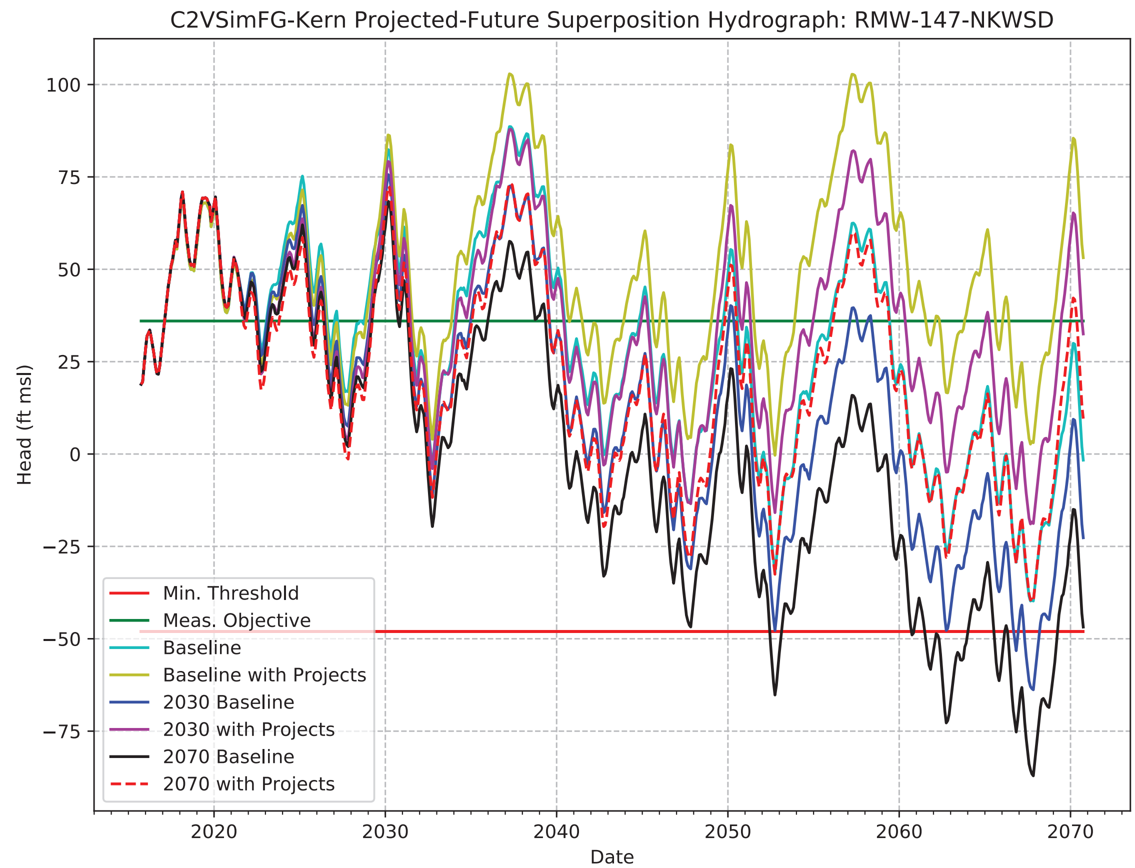
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-142-SWSD
Head (ft msl)
20
0
−20
−40
−60
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

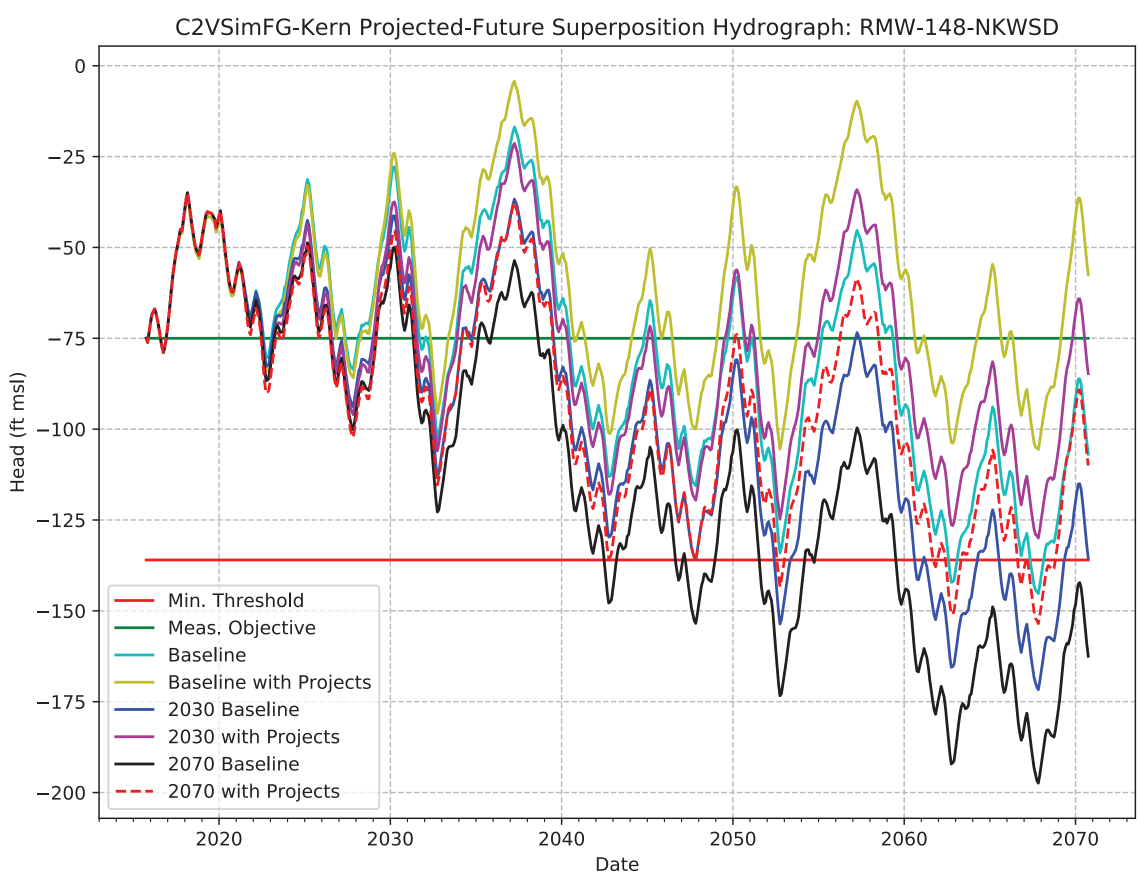



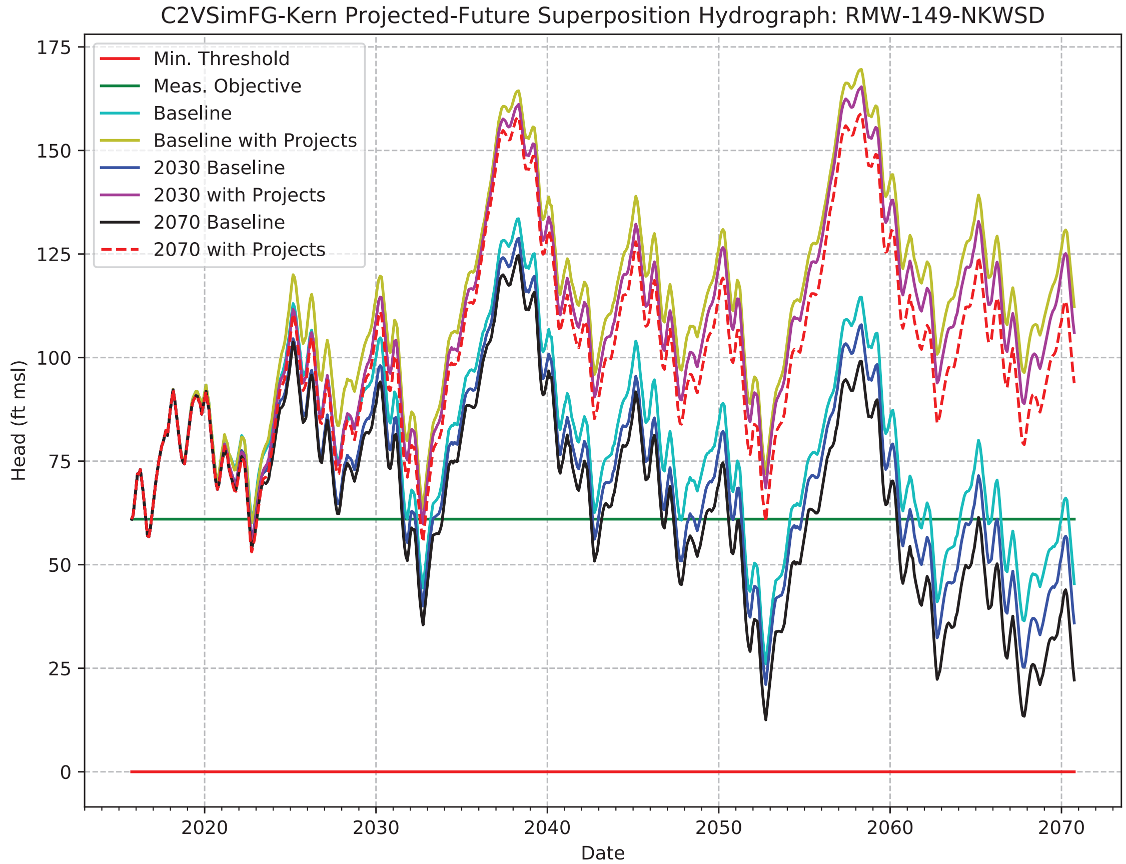
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-143-SWSD
Head (ft msl)
−80
−100
−120
−140
−160
−180
−200
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-145-NKWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
140
120
100
80
60
40
20
0
−20
2020
2030
2040
2050
2060
2070

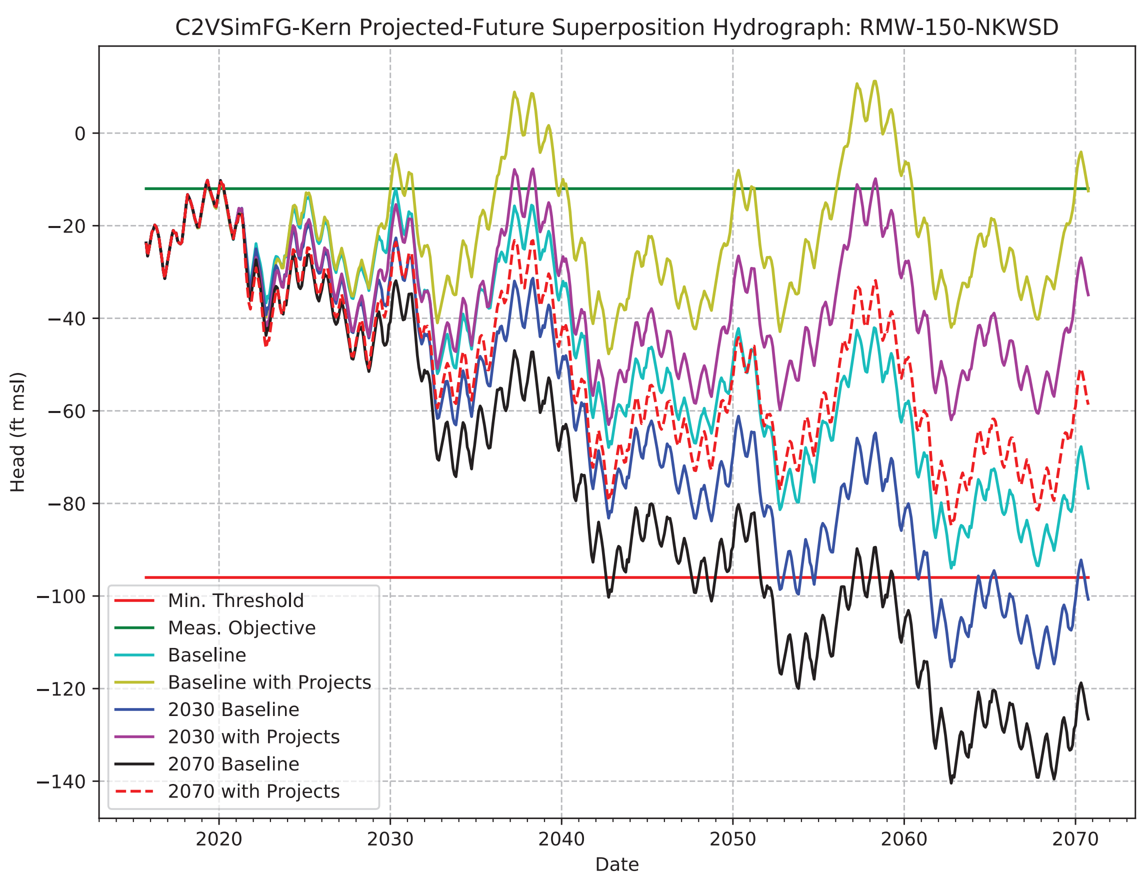

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-146-NKWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
75
50
25
0
−25
−50
−75
−100
2020
2030
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-147-NKWSD
Head (ft msl)
100
75
50
25
0
−25
−50
−75
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

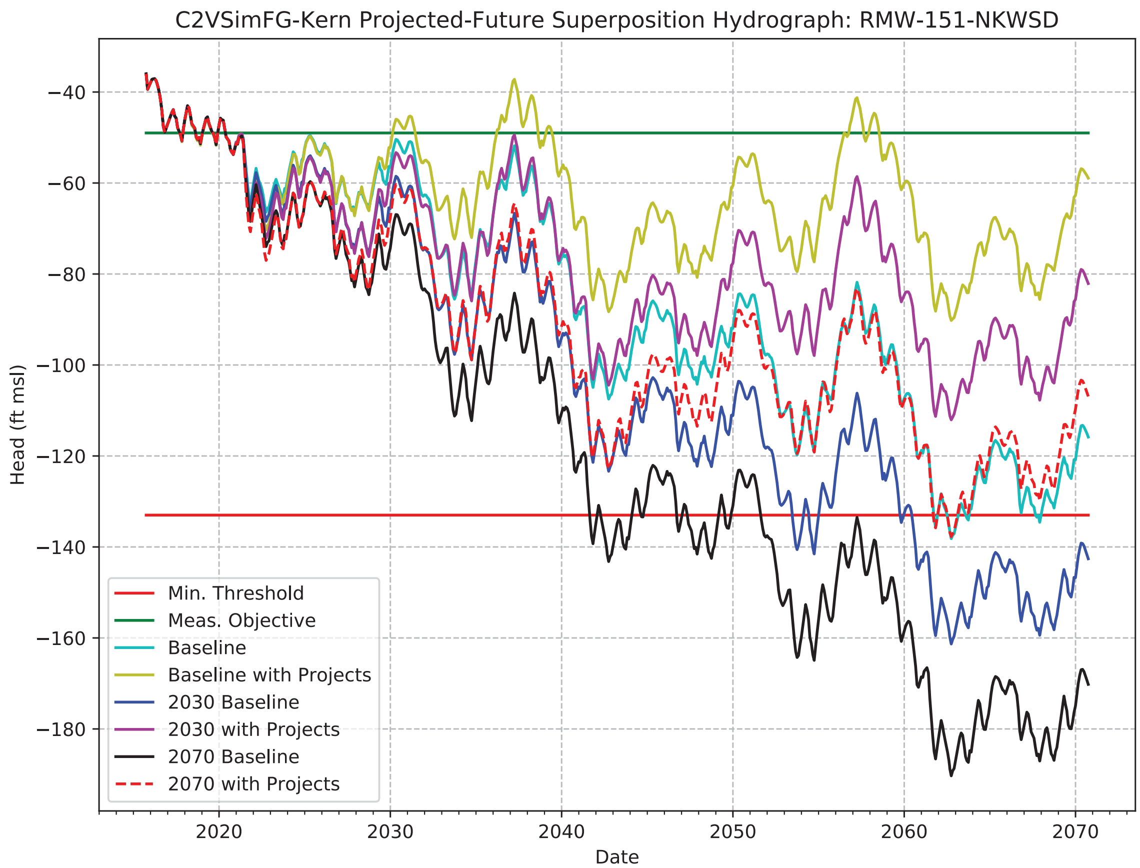

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-148-NKWSD
Head (ft msl)
0
−25
−50
−75
−100
−125
−150
−175
−200
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

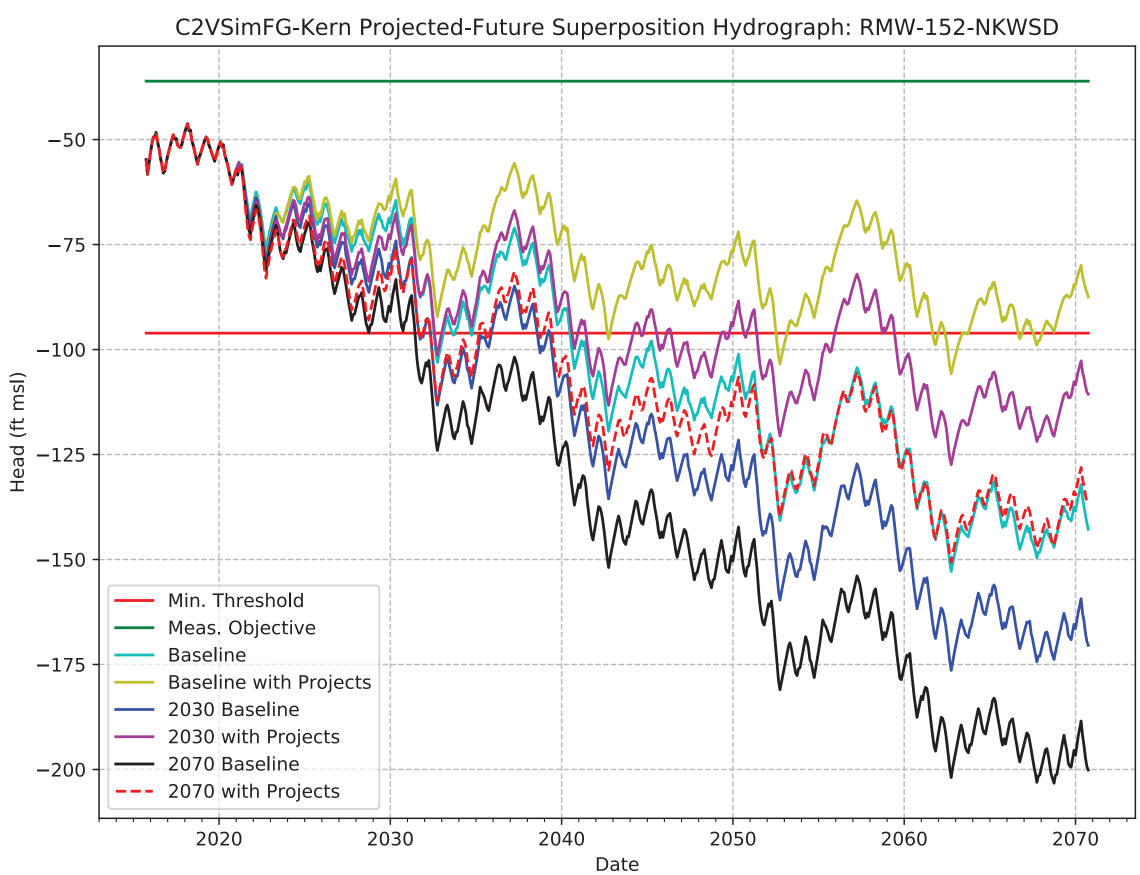


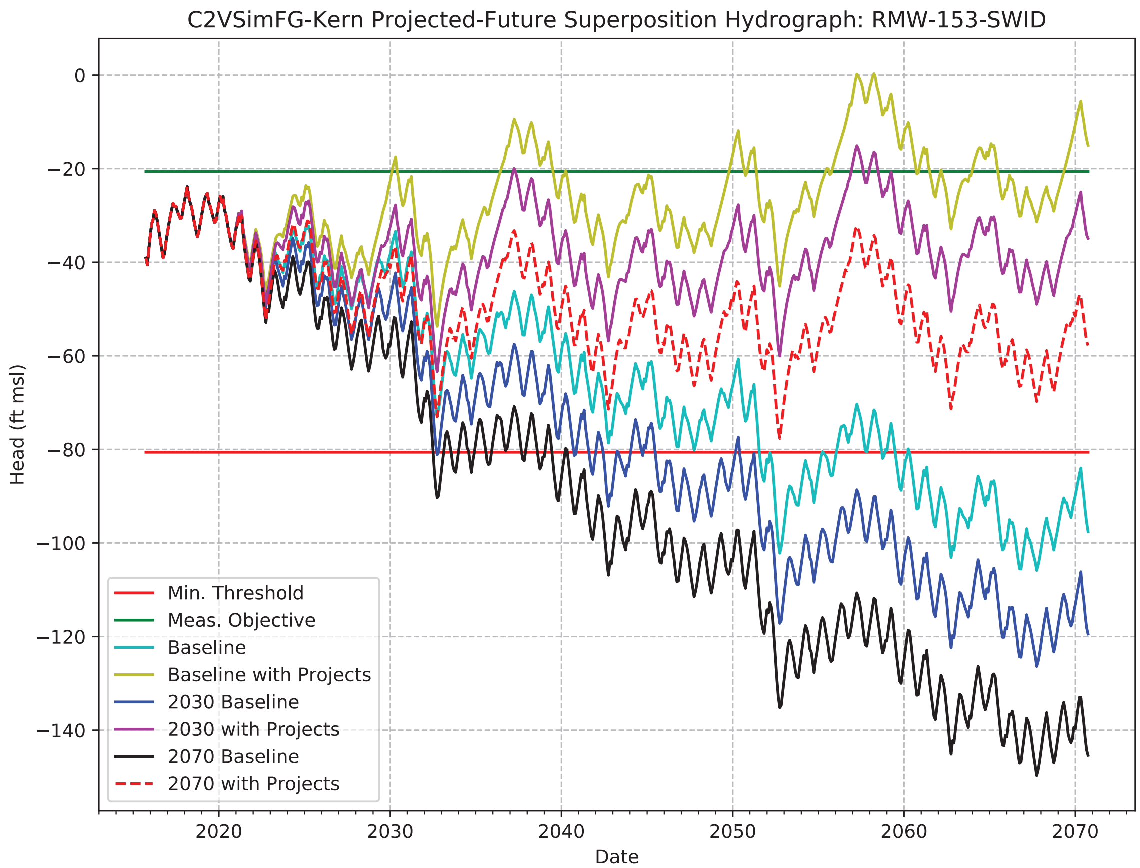
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-149-NKWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
175
150
125
100
75
50
25
0
2020
2030
2040
2050
2060
2070
Date

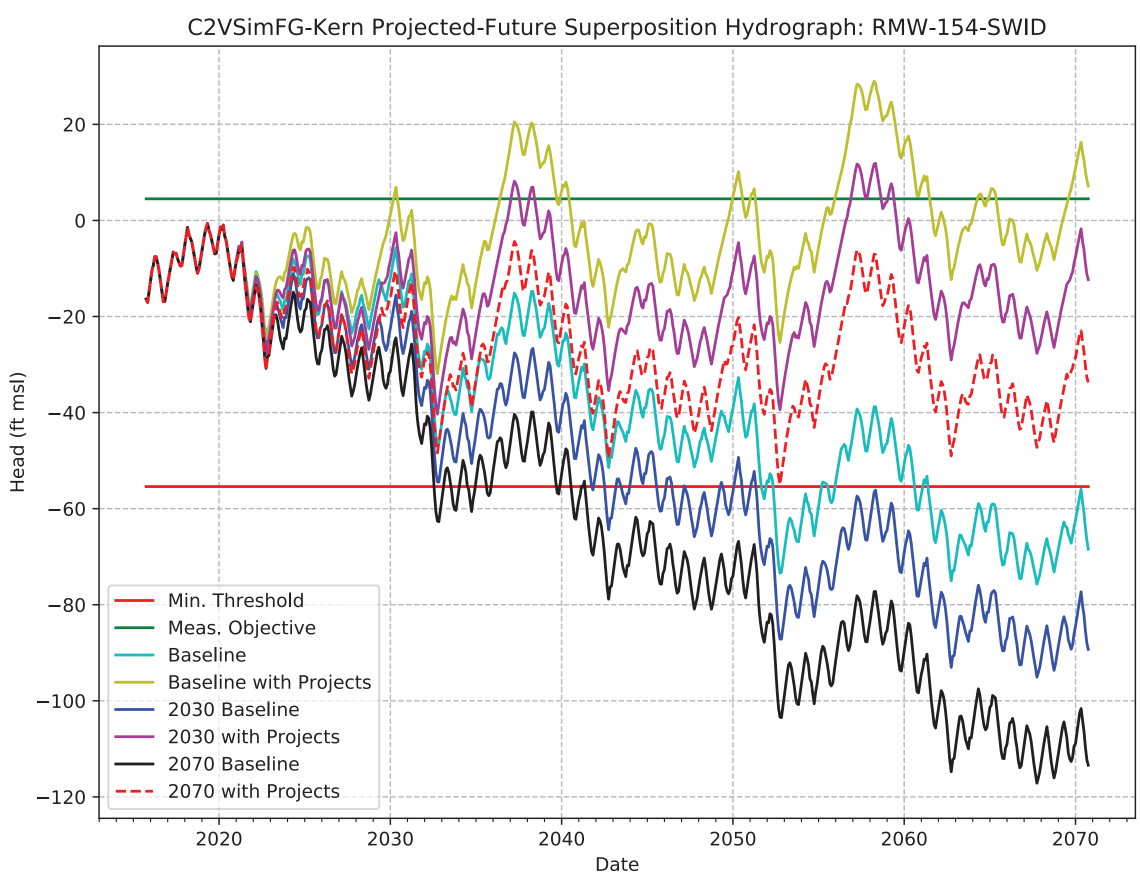
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-150-NKWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
0
−20
−40
−60
−80
−100
−120
−140
2020
2030
2040
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-151-NKWSD
Head (ft msl)
−40
−60
−80
−100
−120
−140
−160
−180
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

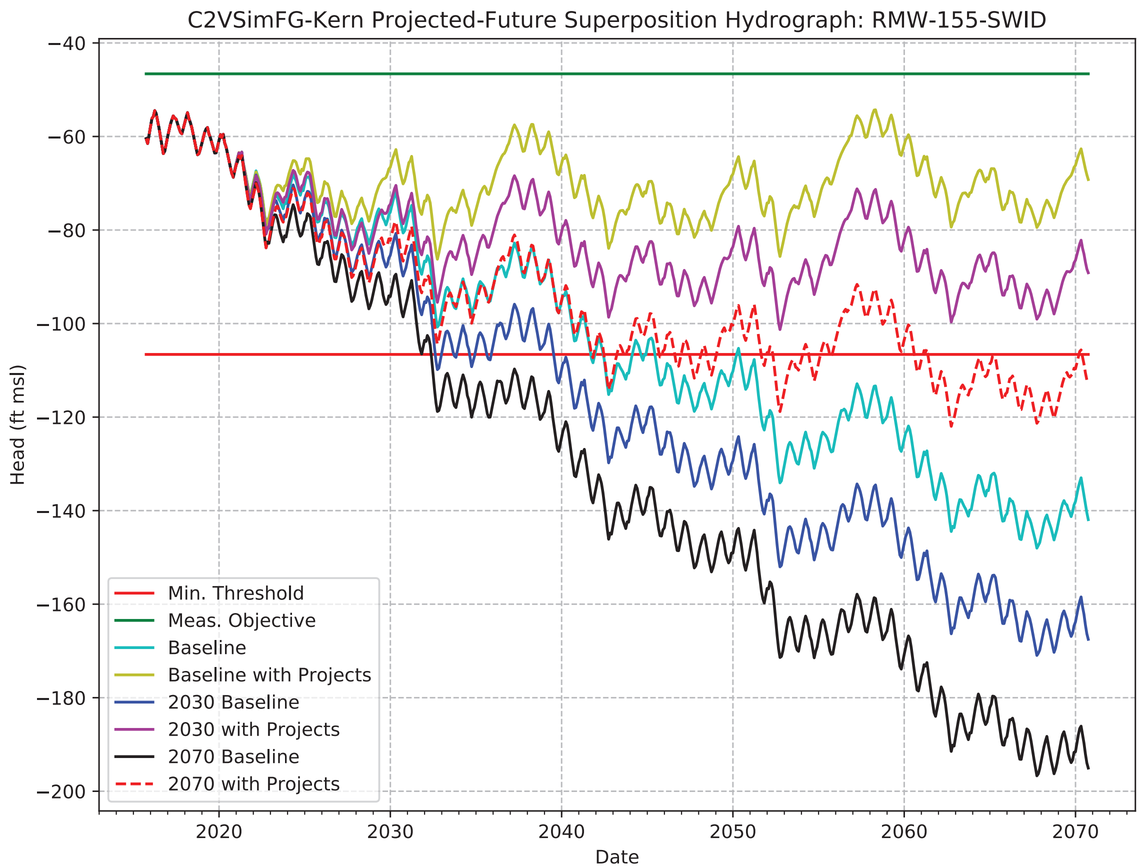

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-152-NKWSD
Head (ft msl)
−50
−75
−100
−125
−150
−175
−200
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

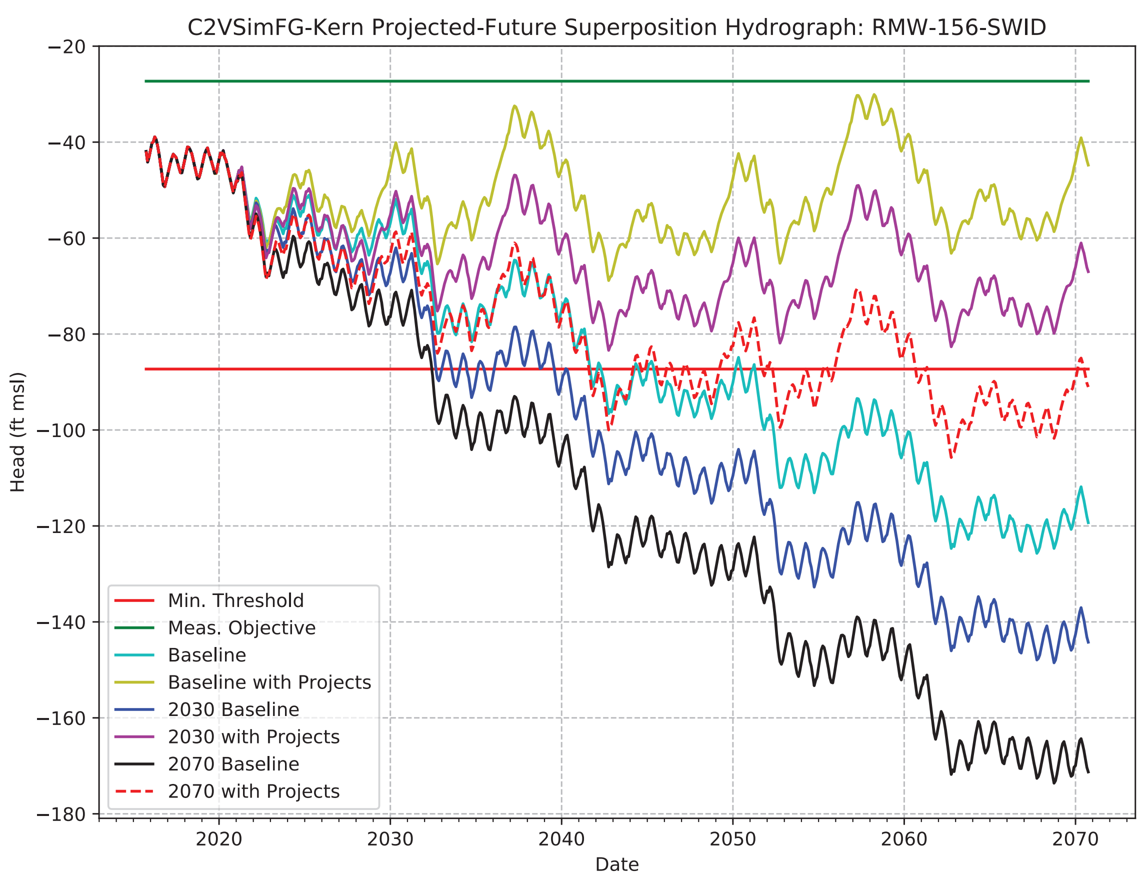


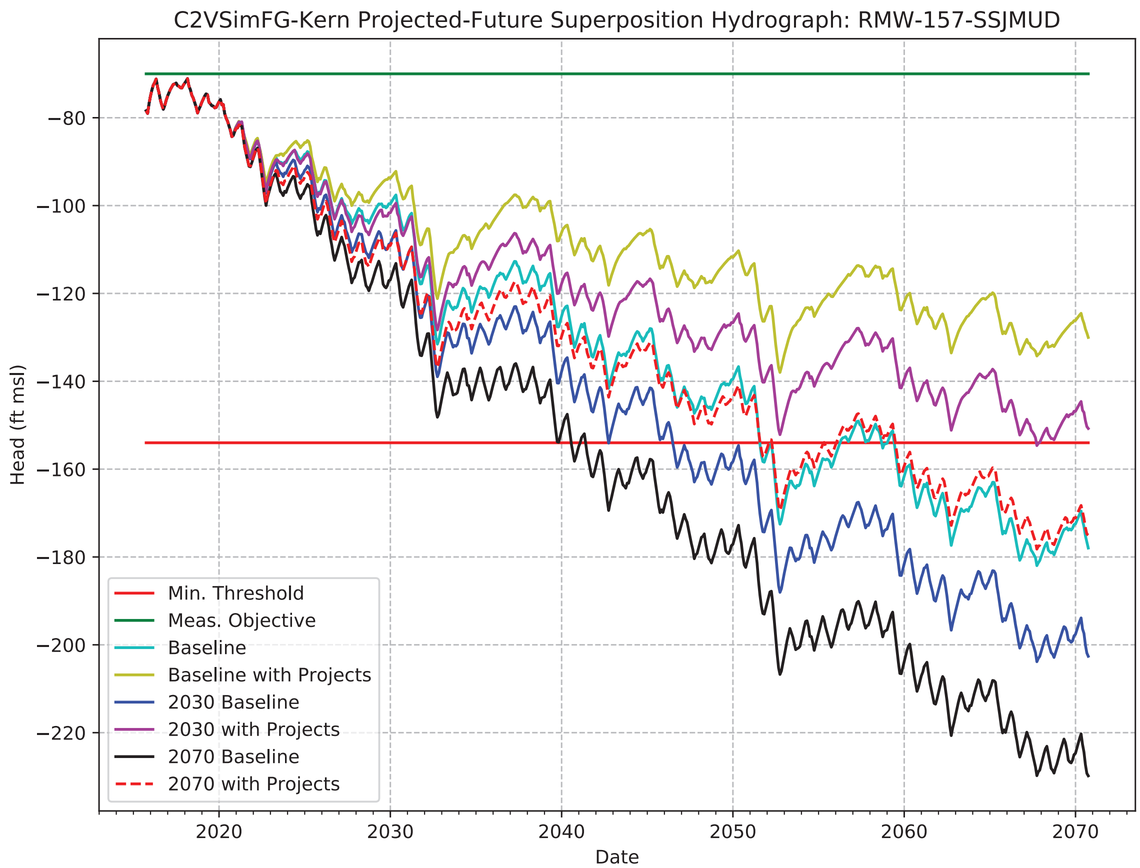
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-153-SWID
Head (ft msl)
0
−20
−40
−60
−80
−100
−120
−140
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

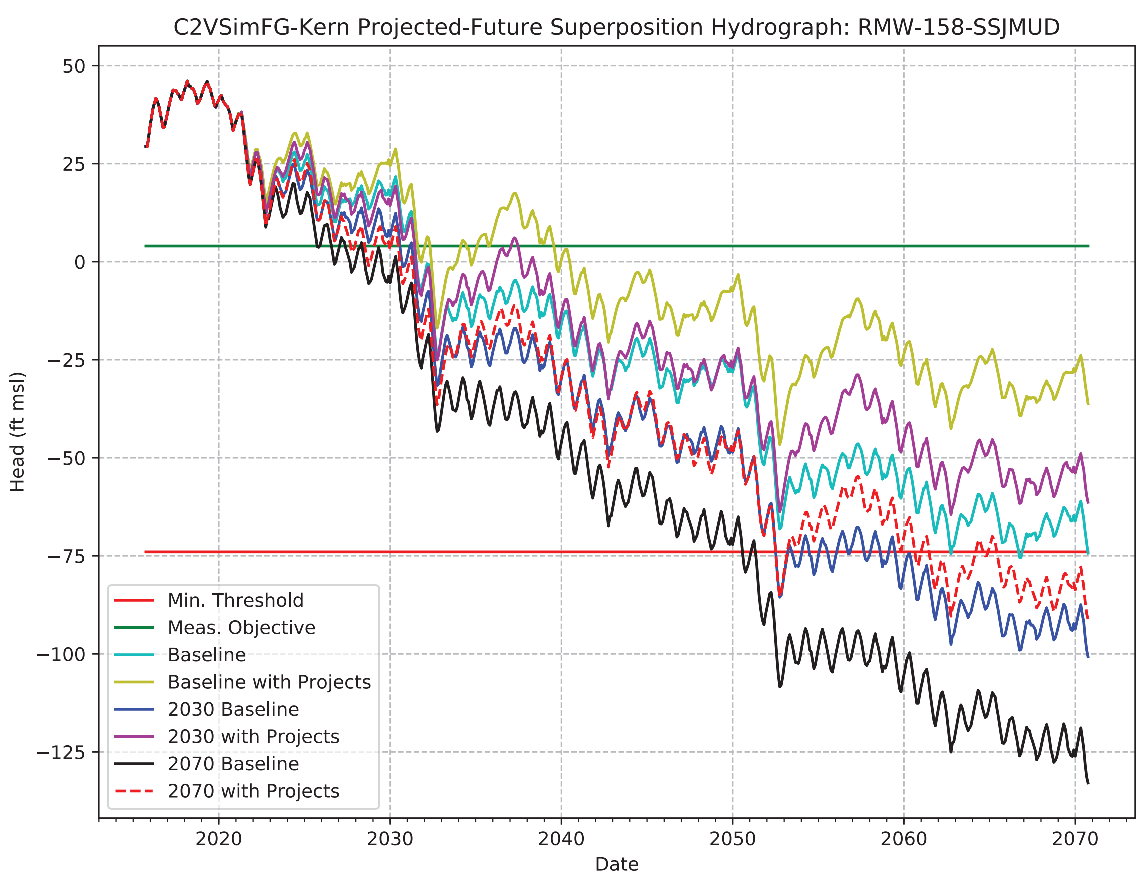
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-154-SWID
Head (ft msl)
20
0
−20
−40
−60
−80
−100
−120
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-155-SWID
Head (ft msl)
Date
−40
−60
−80
−100
−120
−140
−160
−180
−200
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

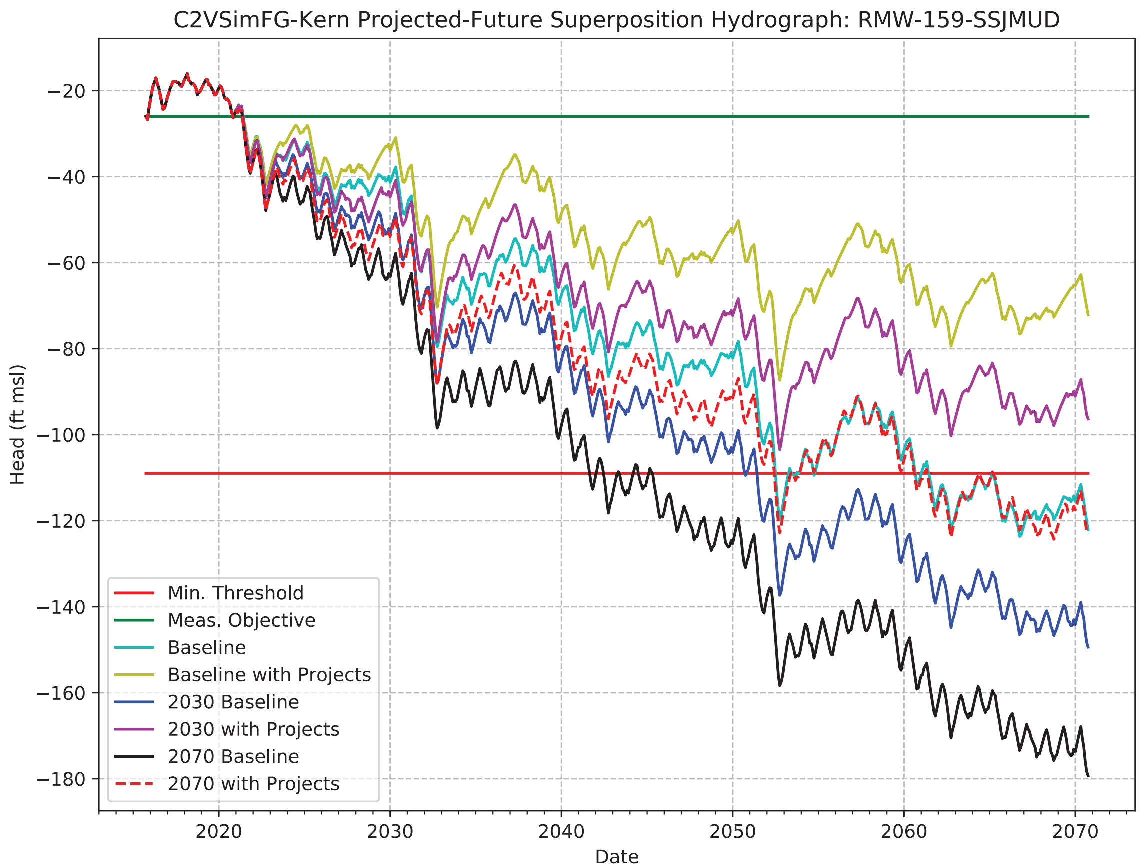

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-156-SWID
Head (ft msl)
Date
−20
−40
−60
−80
−100
−120
−140
−160
−180
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

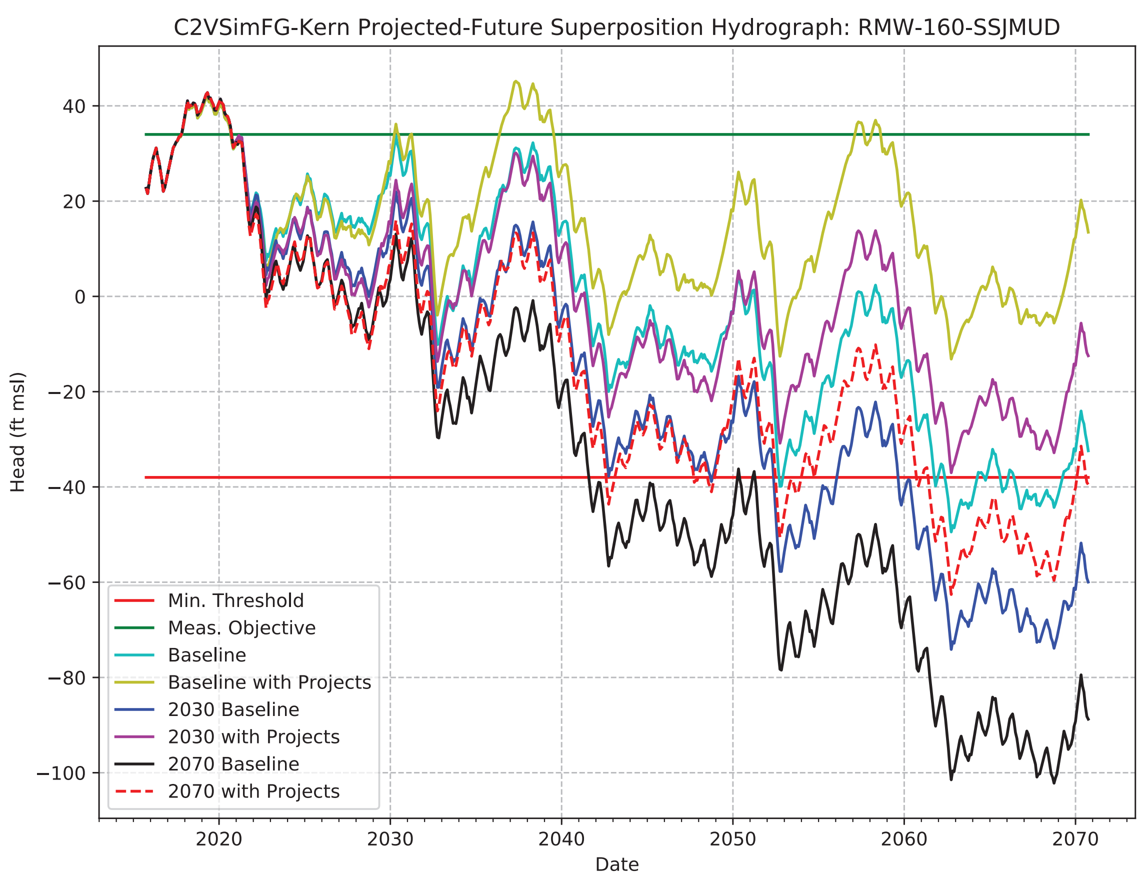


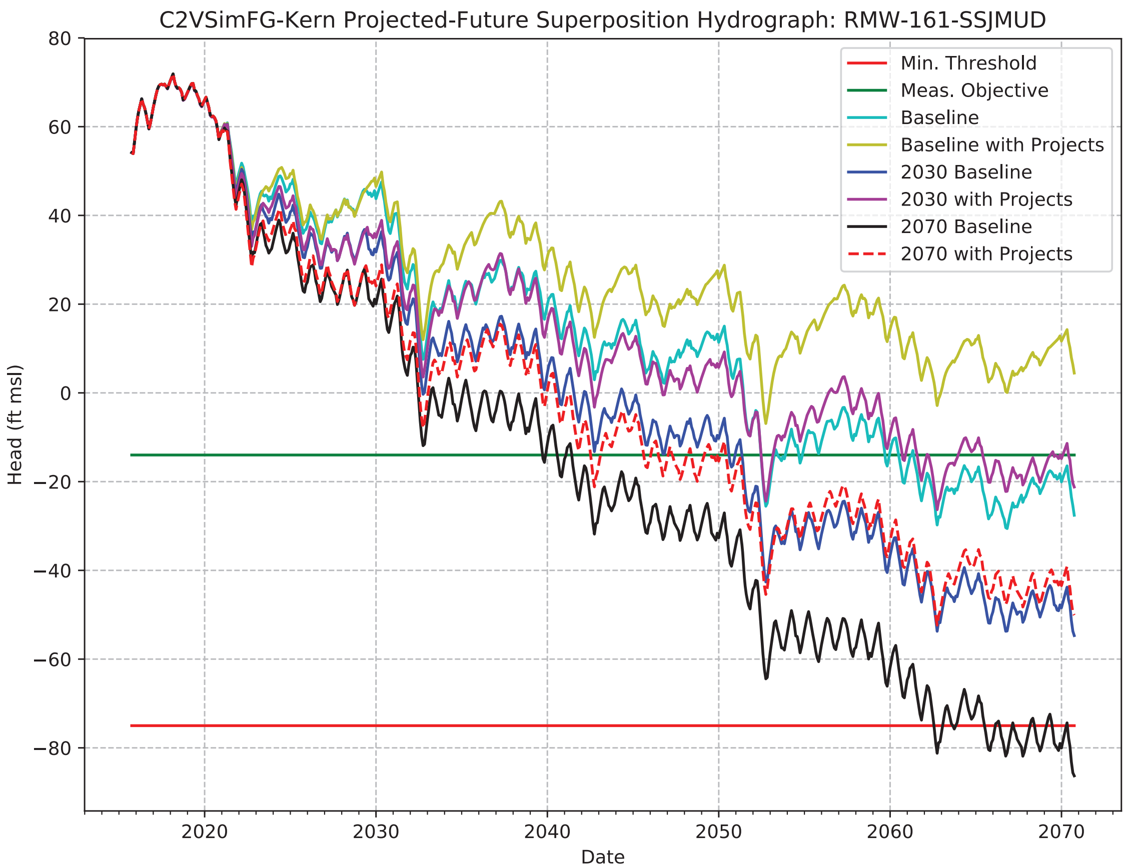
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-157-SSJMUD
Head (ft msl)
−80
−100
−120
−140
−160
−180
−200
−220
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
2020
2030
2040
2050
2060
2070
Date

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-158-SSJMUD
Head (ft msl)
50
25
0
−25
−50
−75
−100
−125
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
2020
2030
2040
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-159-SSJMUD
Head (ft msl)
−20
−40
−60
−80
−100
−120
−140
−160
−180
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-160-SSJMUD
Head (ft msl)
40
20
0
−20
−40
−60
−80
−100
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-161-SSJMUD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
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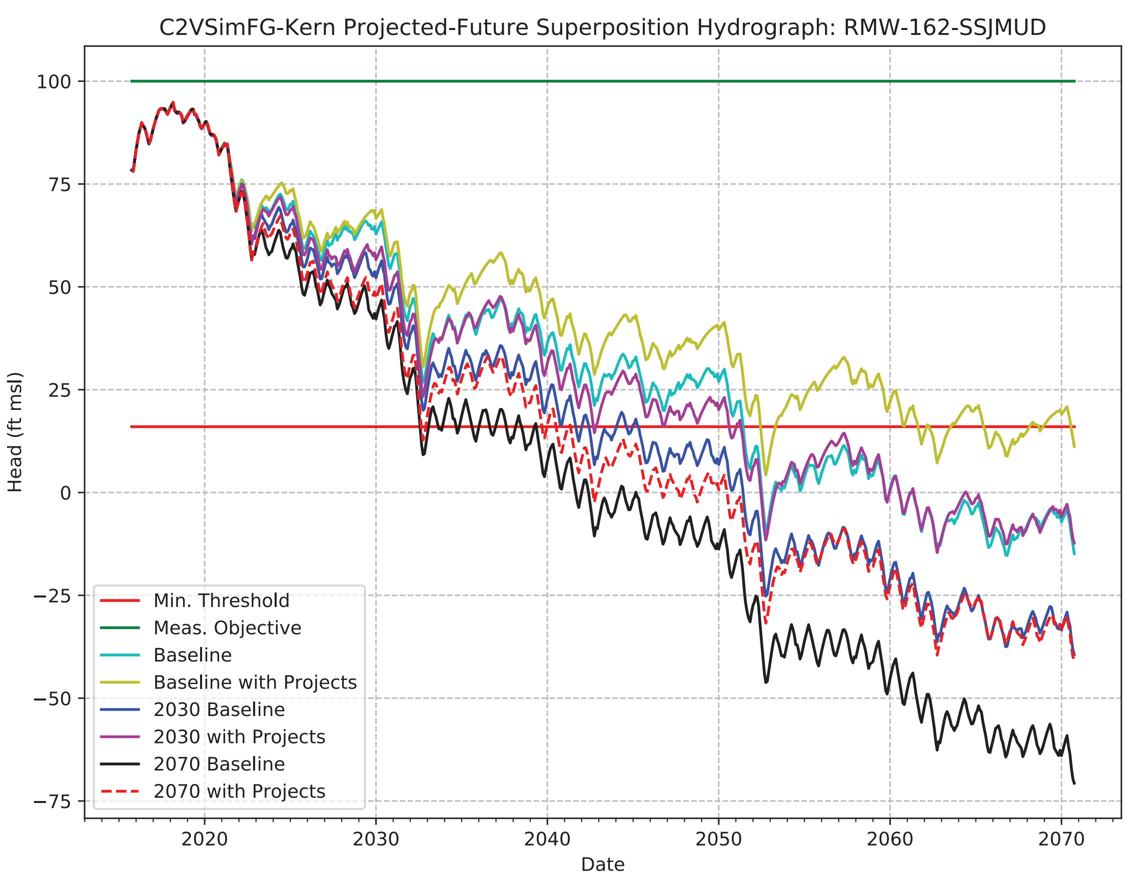
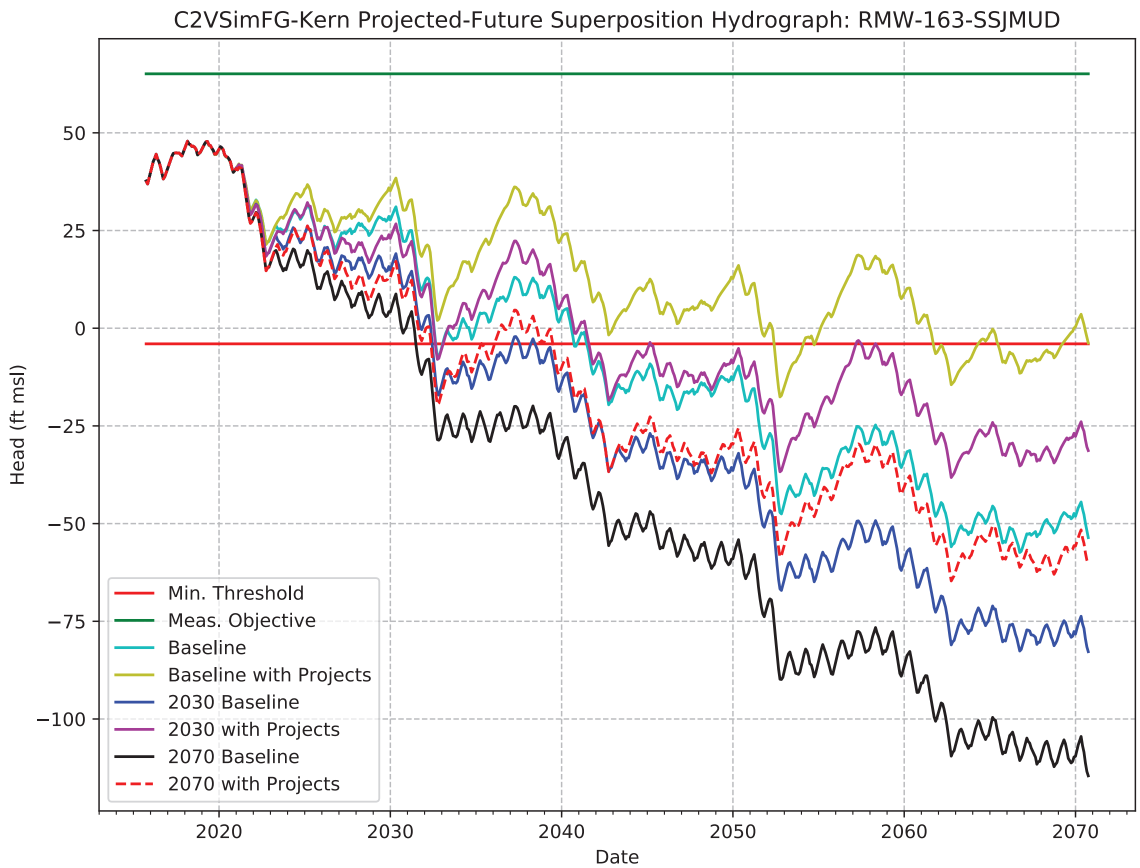
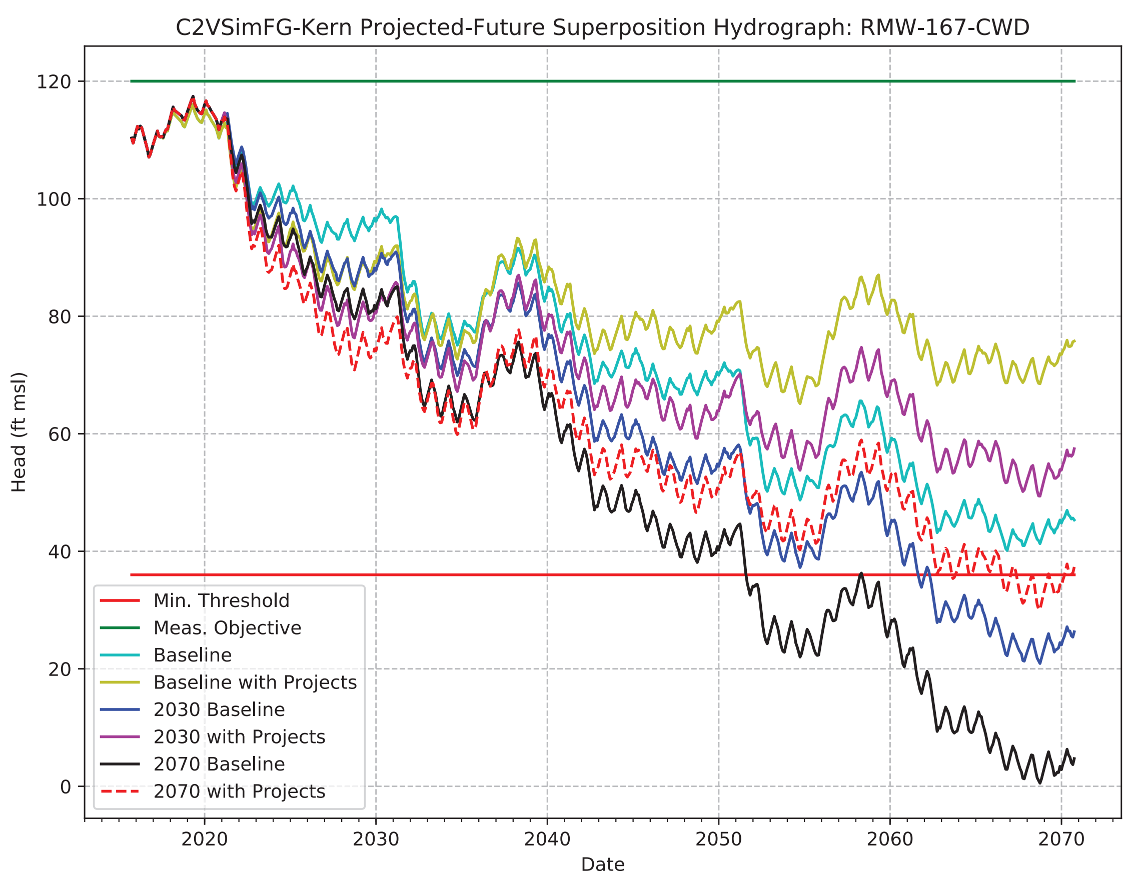
2040
2050
2060
2070

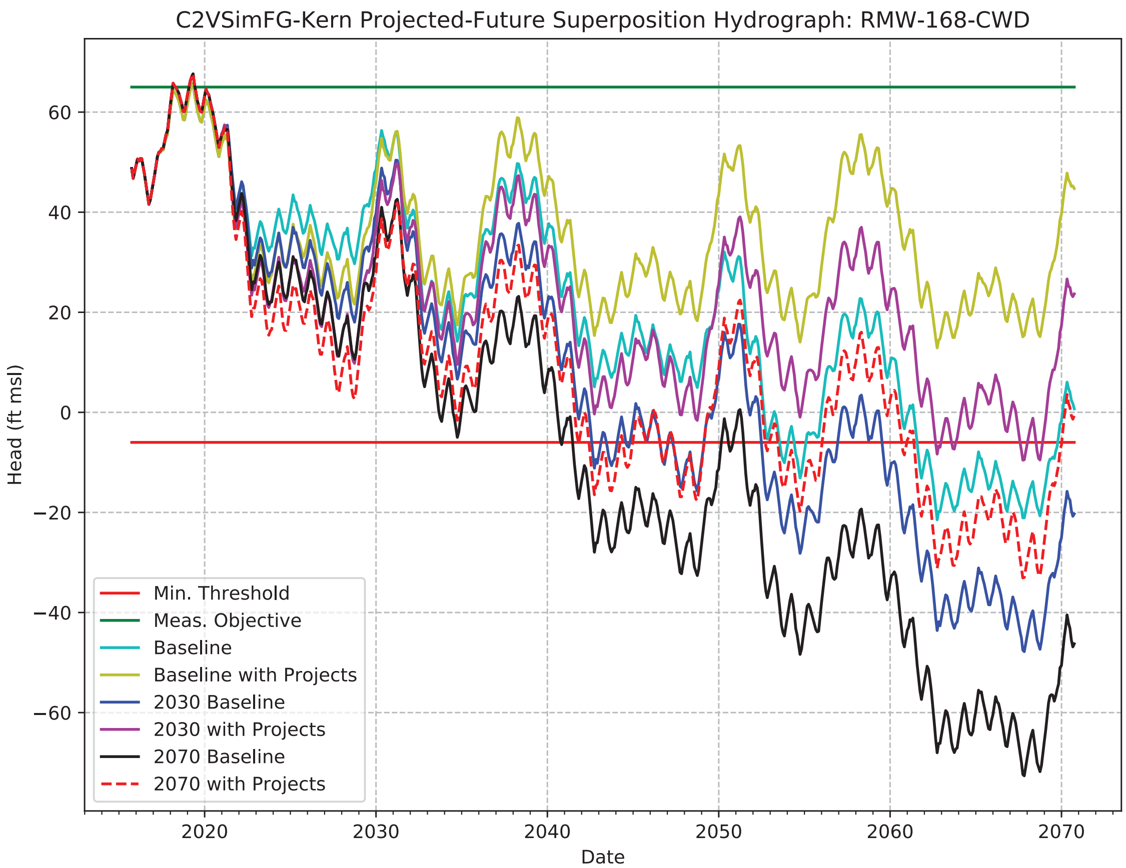

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-162-SSJMUD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
100
75
50
25
0
−25
−50
−75
2020
2030
2040
2050
2060
2070

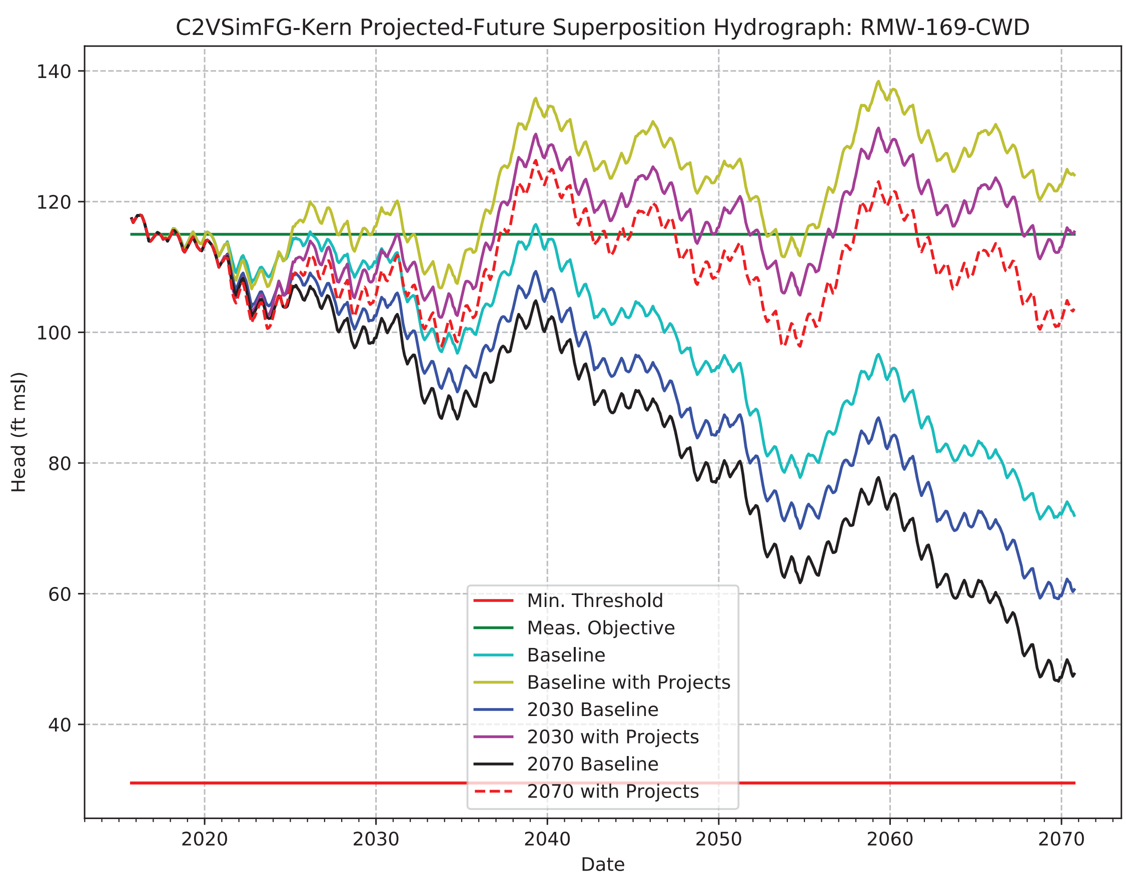


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-163-SSJMUD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-167-CWD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-168-CWD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-169-CWD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
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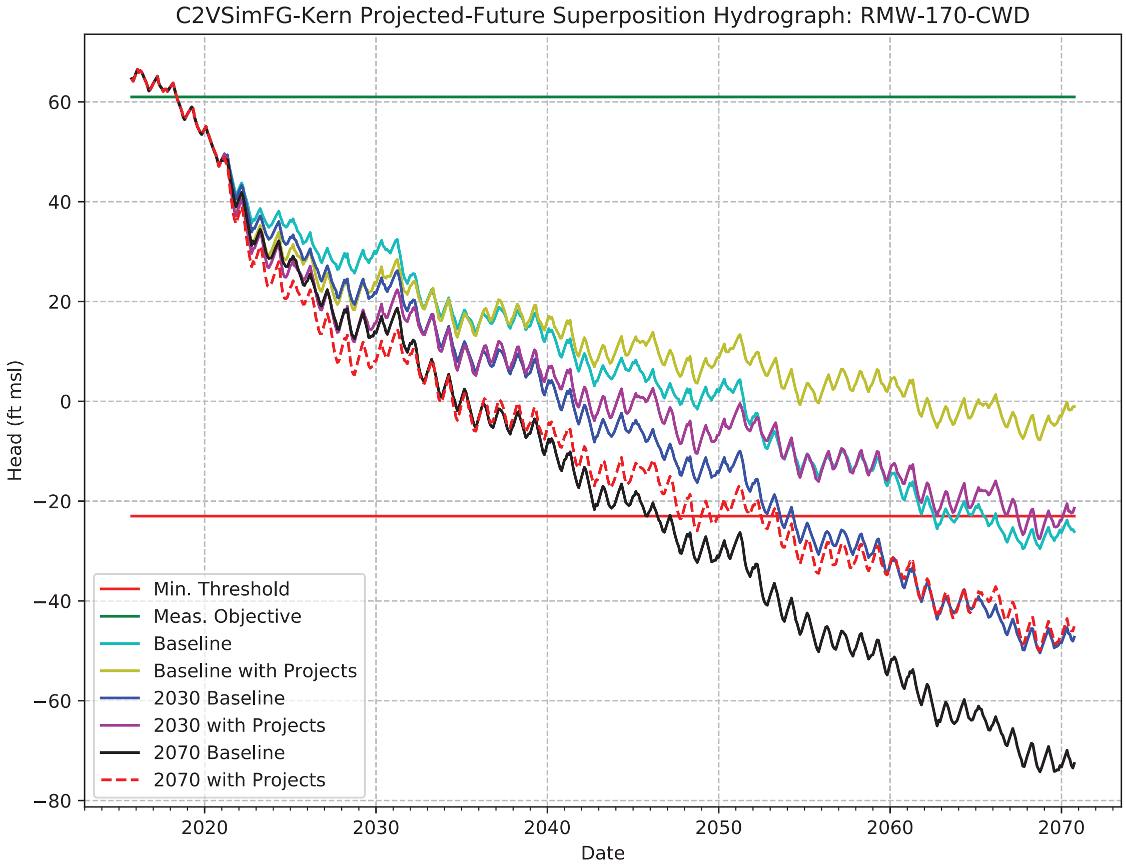
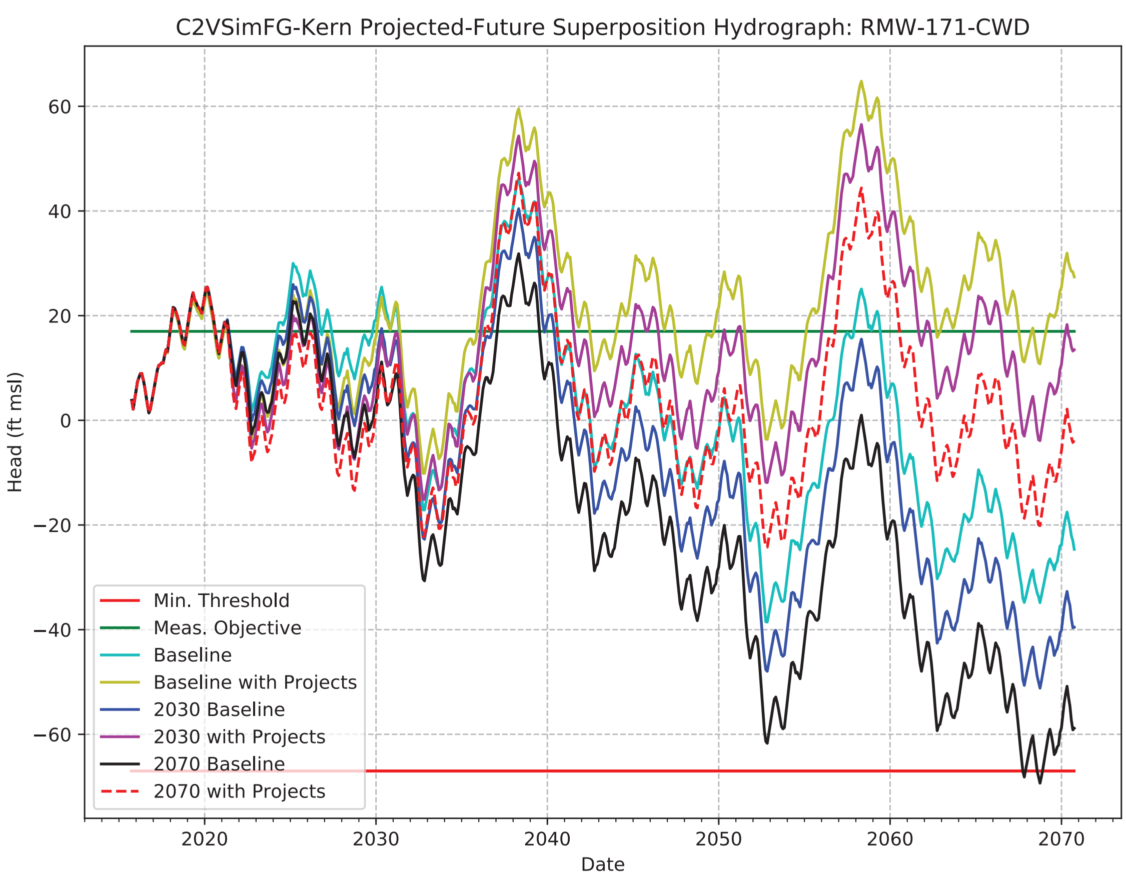
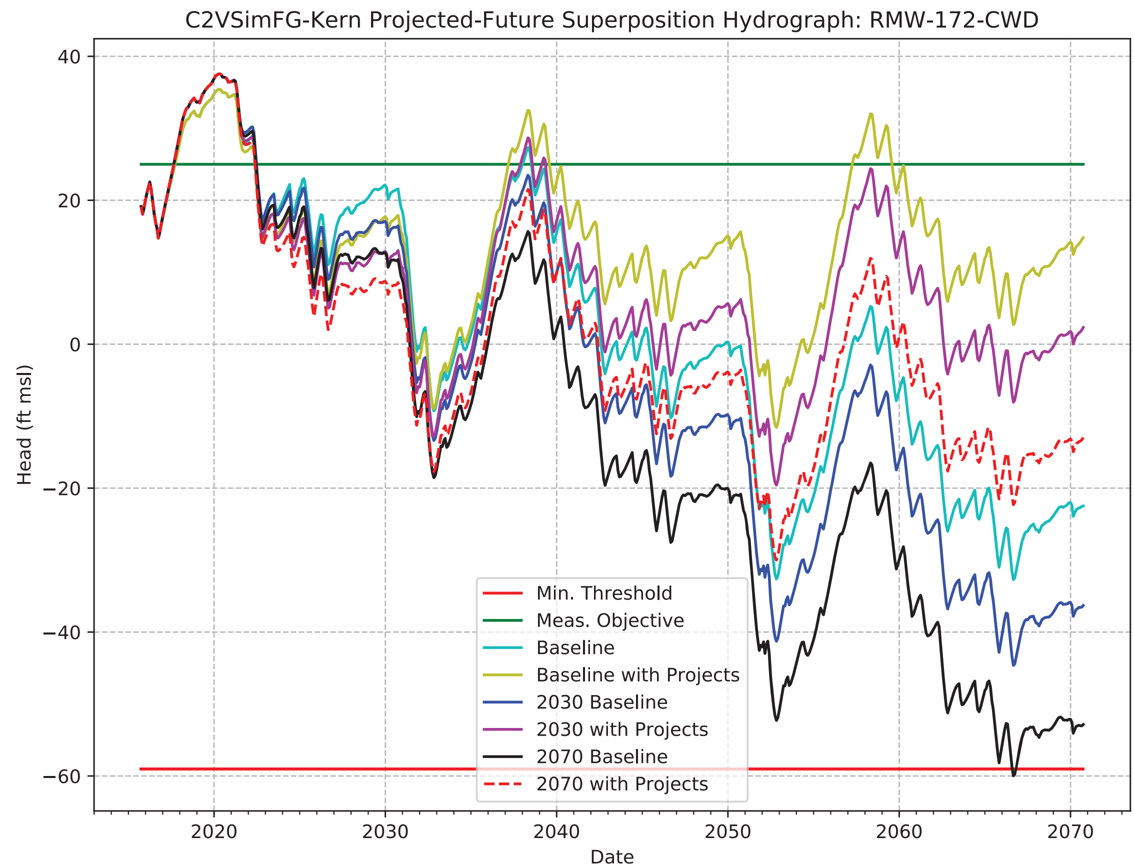
2030 with Projects
2070 Baseline
2070 with Projects

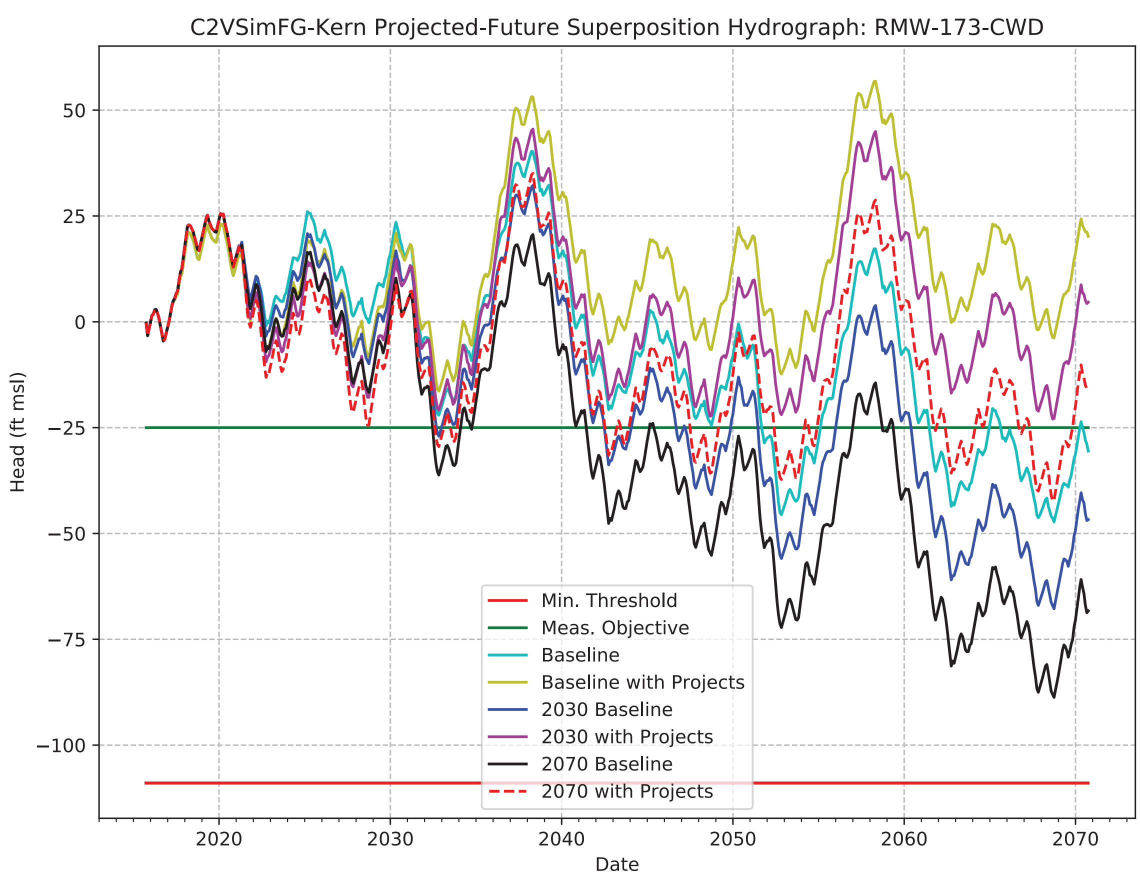


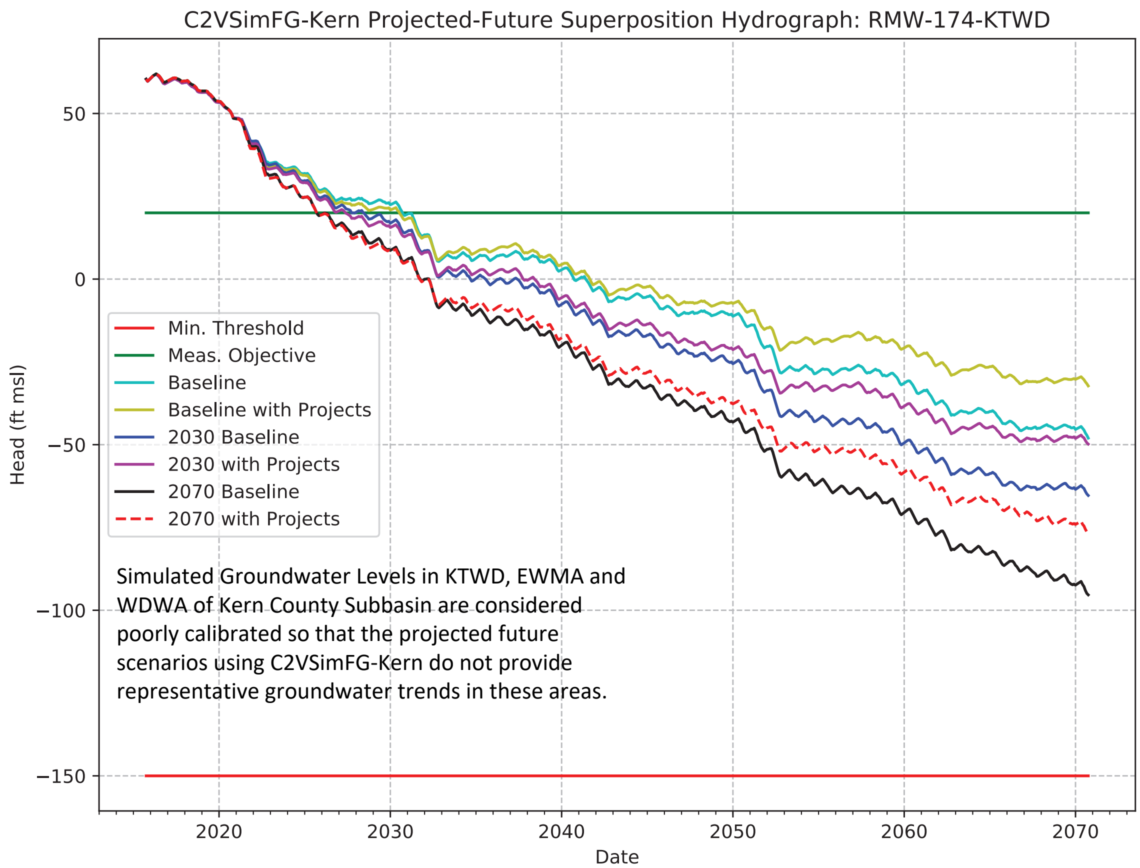
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-170-CWD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

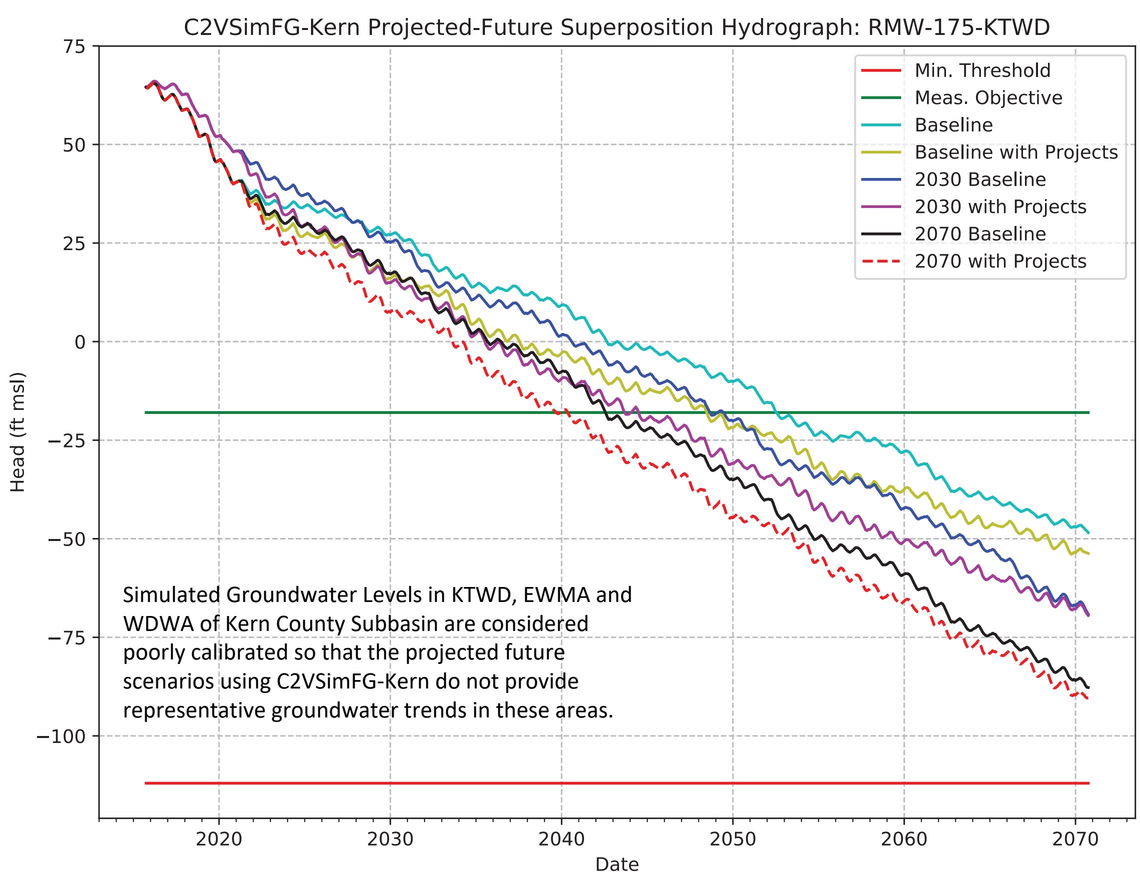



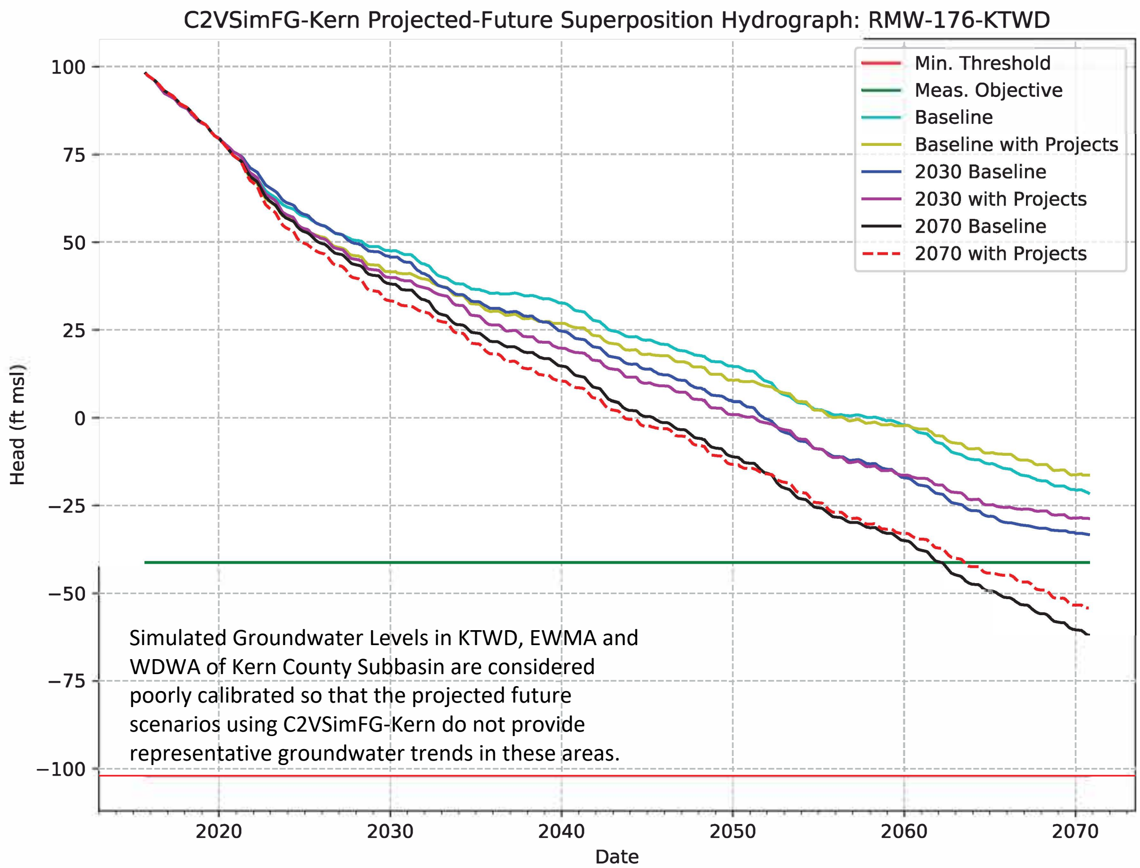
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-171-CWD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-172-CWD
Head (ft msl)
Date
40
20
0
−20
−40
−60
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-173-CWD
Head (ft msl)
Date
50
25
0
−25
−50
−75
−100
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-174-KTWD
50
0
−50
−100
−150
Head (ft msl)
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-175-KTWD
75
50
25
0
−25
−50
−75
−100
Head (ft msl)
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-176-KTWD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
100
75
50
25
0
−25
−50
−75
−100
2020
2030
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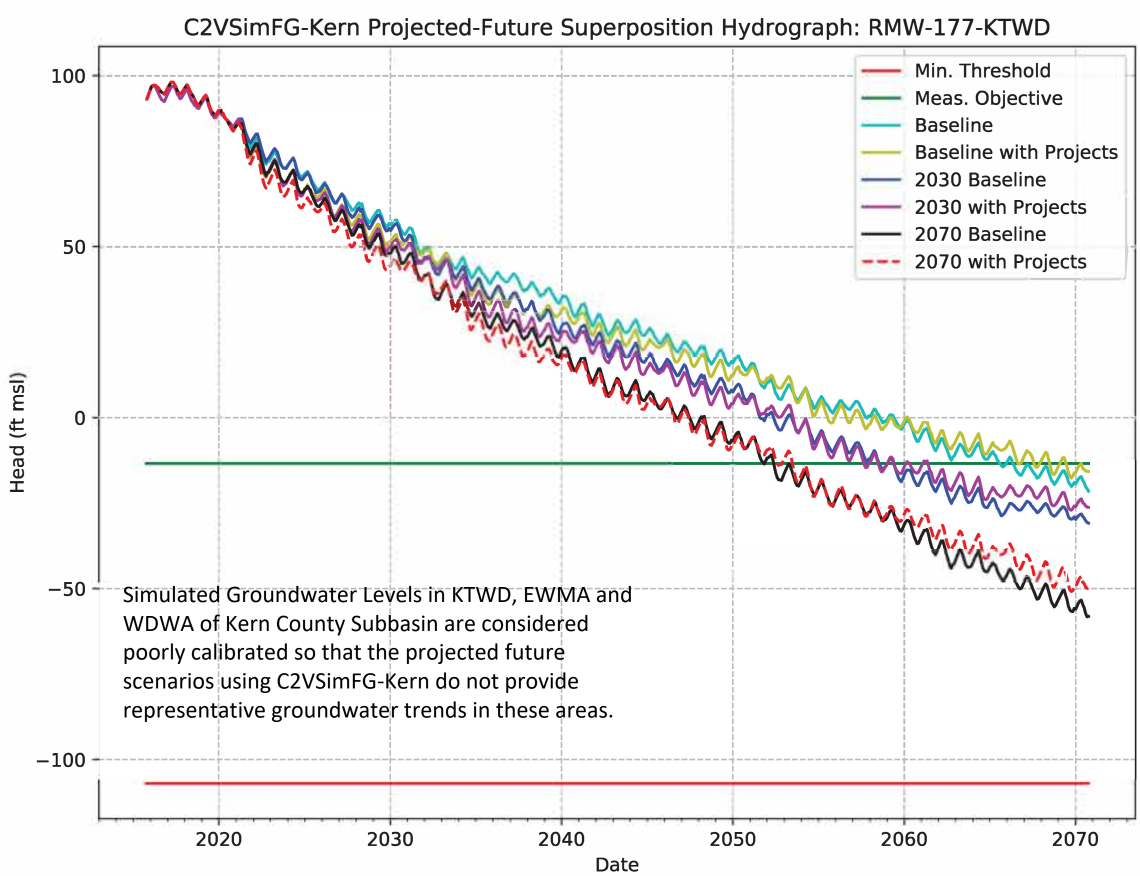
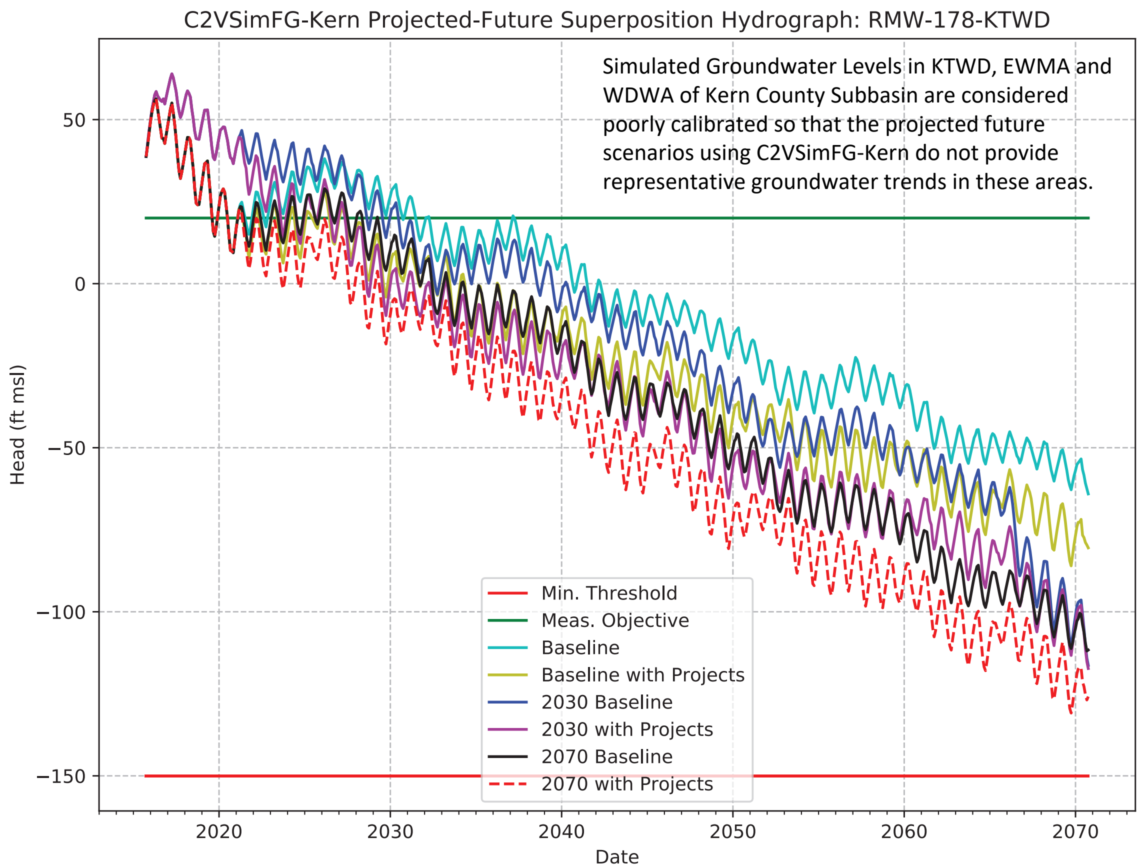
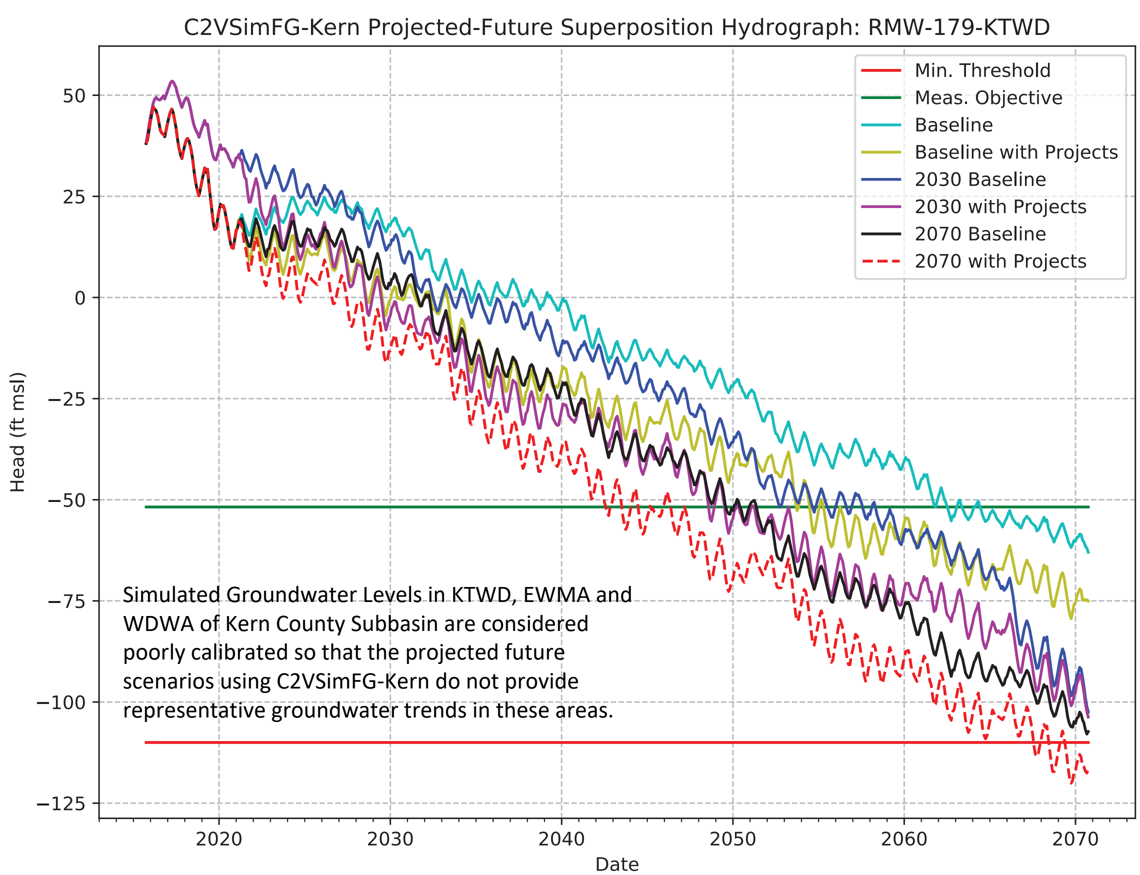
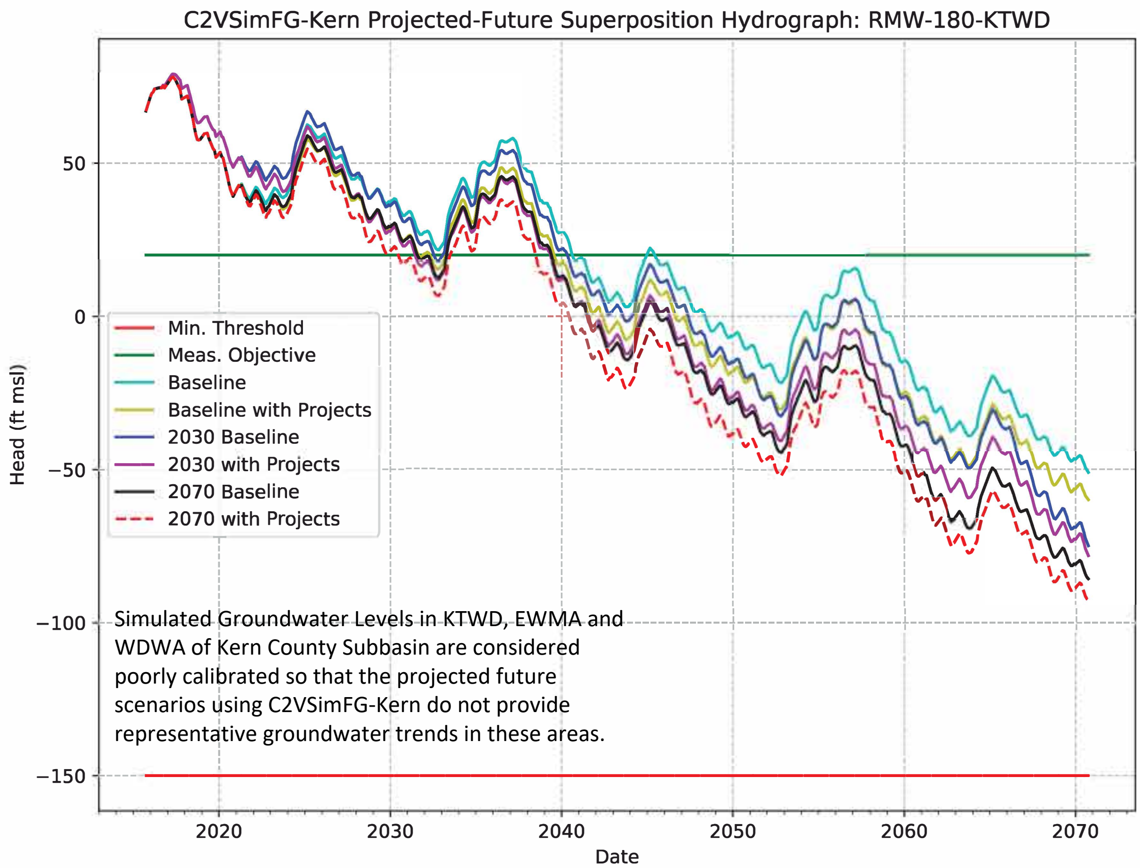
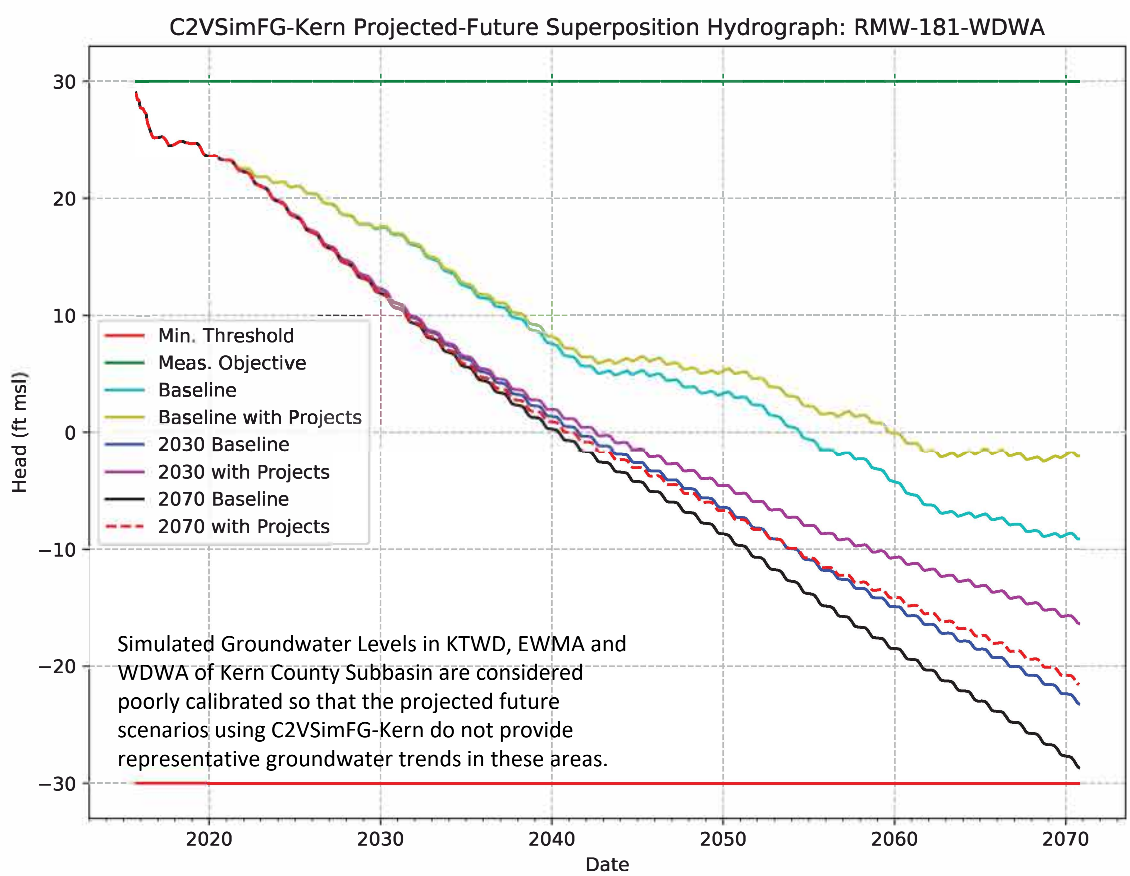
2050
2060
2070
Date
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.

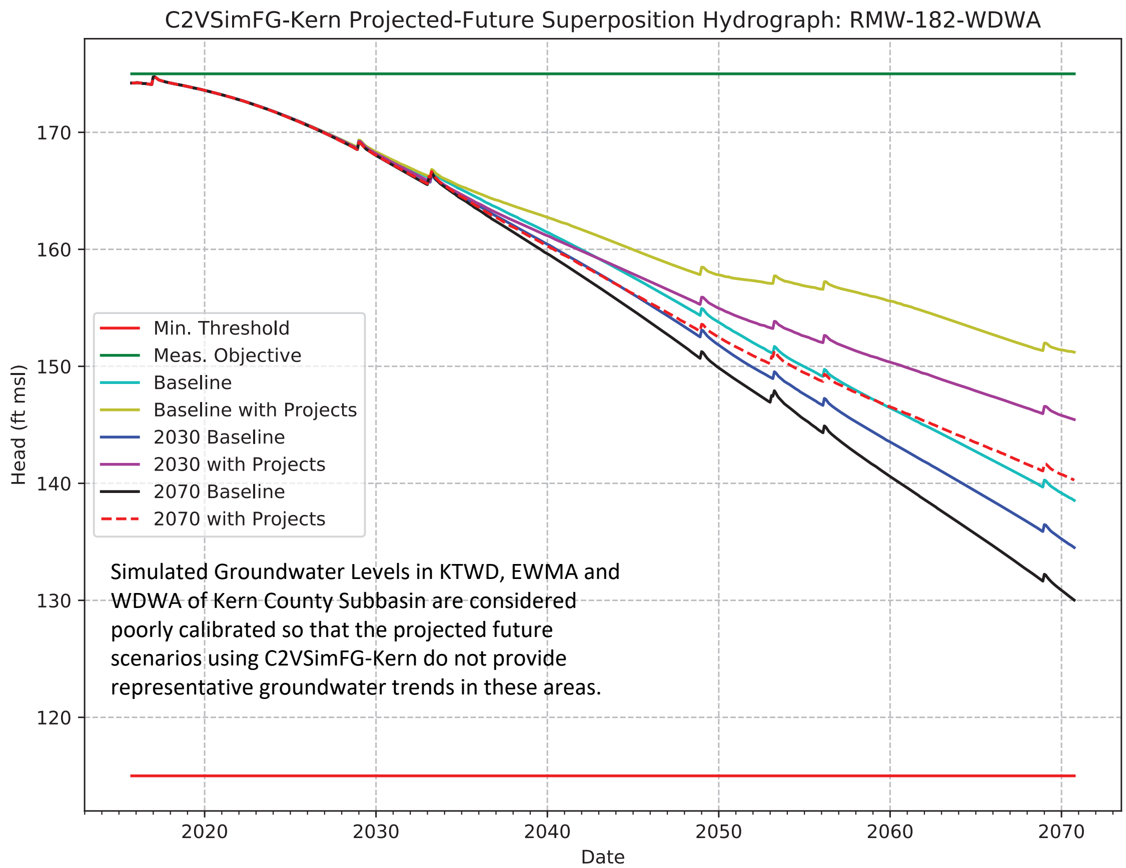

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-177-KTWD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
100
50
0
−50
−100
2020
2030
2040
2050
2060
2070
Date
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.

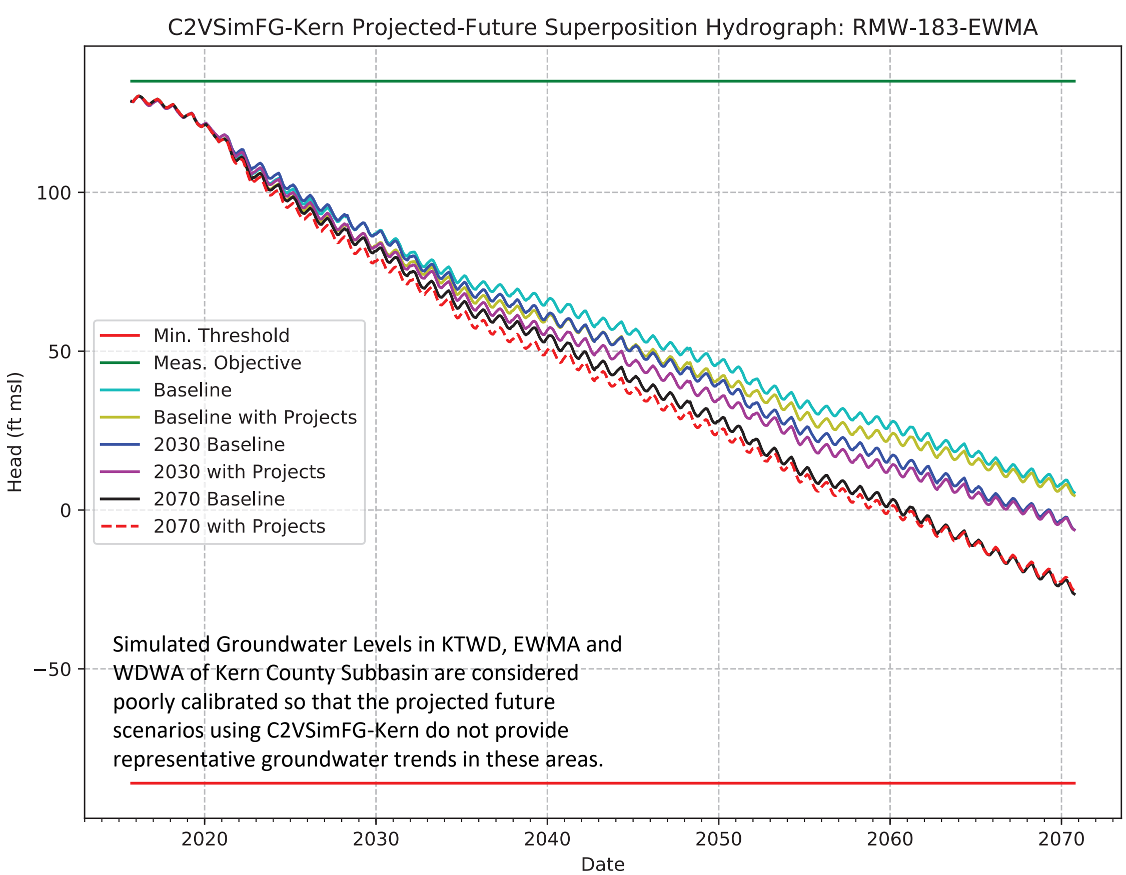

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-178-KTWD
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.
Head (ft msl)
50
0
−50
−100
−150
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

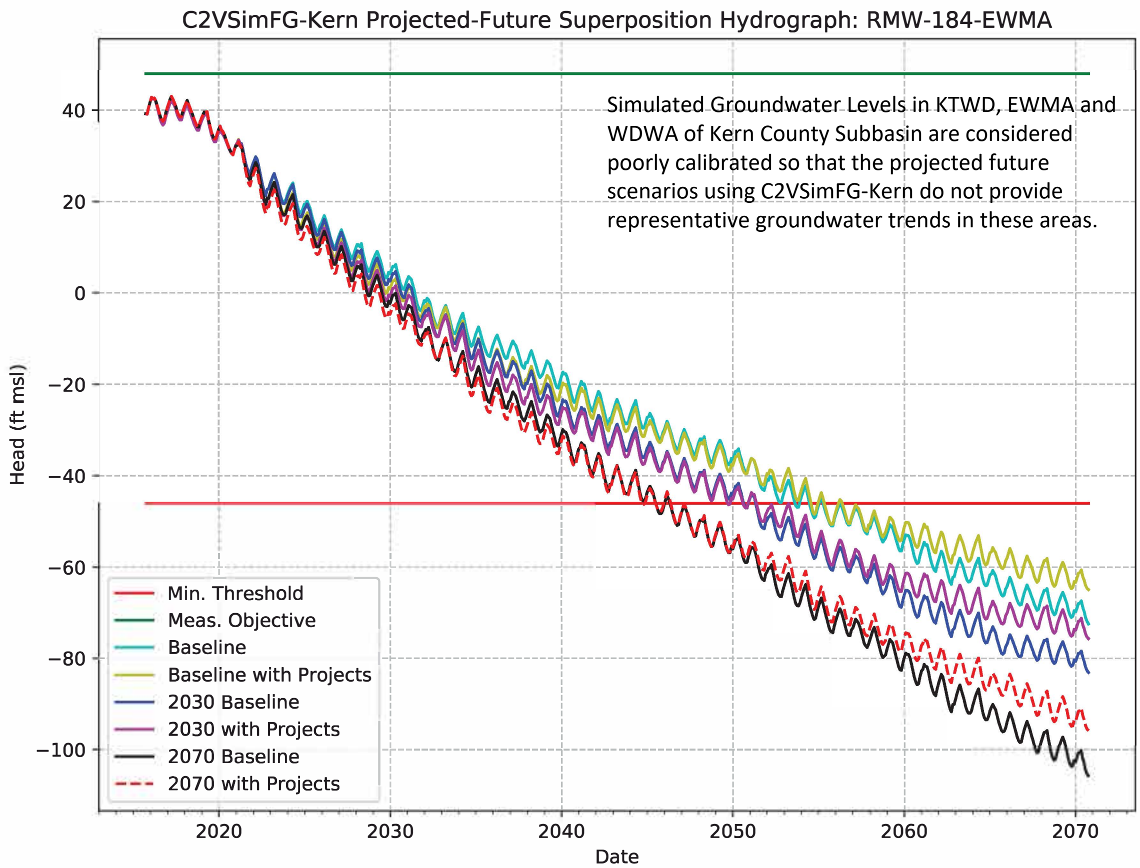

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-179-KTWD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.
Head (ft msl)
50
25
0
−25
−50
−75
−100
−125
2020
2030
2040
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-180-KTWD
Head (ft msl)
50
0
−50
−100
−150
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.

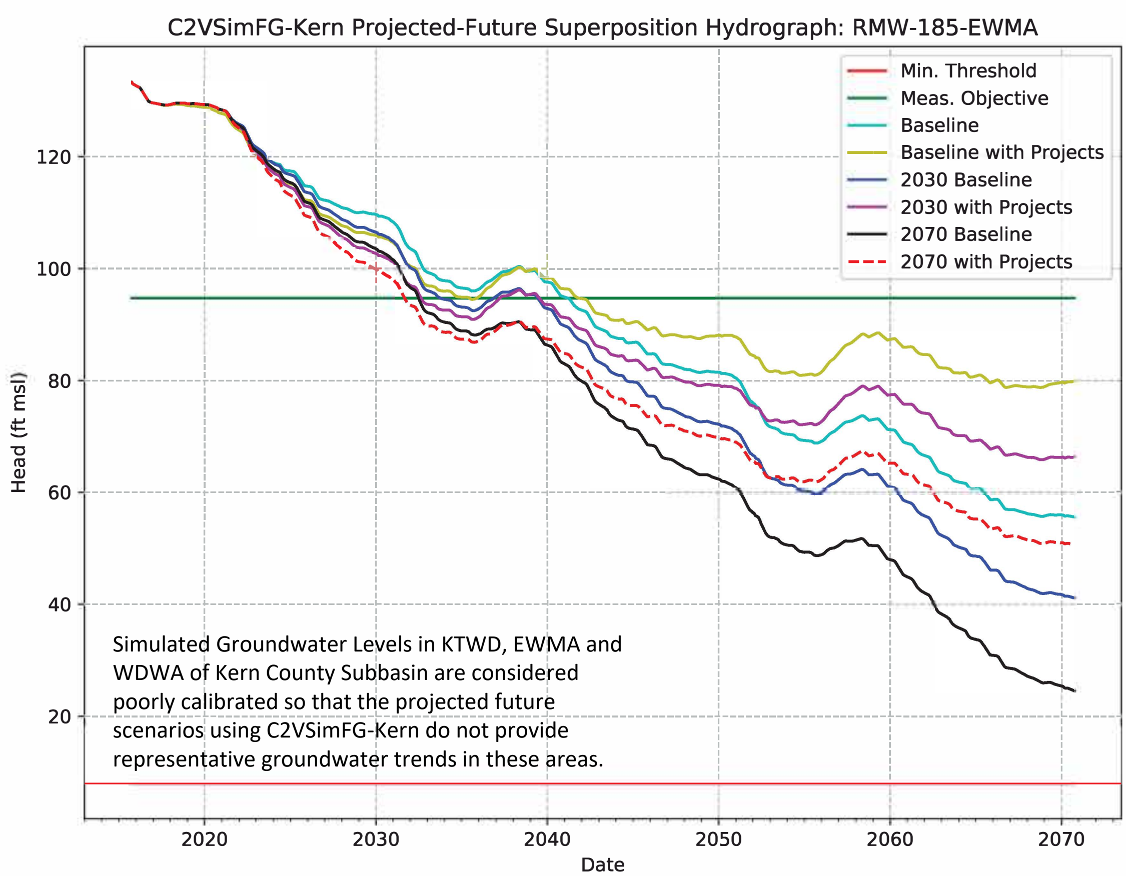

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-181-WDWA
Head (ft msl)
30
20
10
0
−10
−20
−30
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-182-WDWA
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.
170
160
150
140
130
120
2020
2030
2040
2050
2060
2070

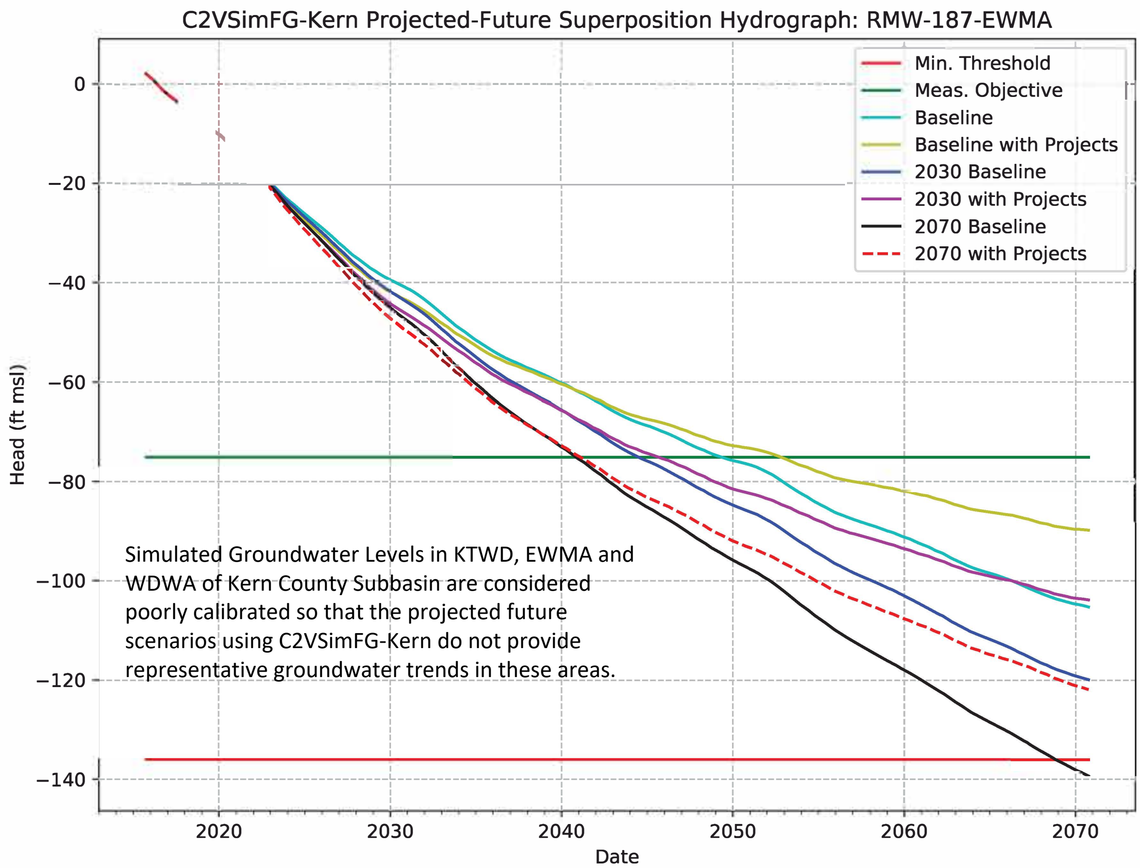

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-183-EWMA
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.
100
50
0
−50
2020
2030
2040
2050
2060
2070

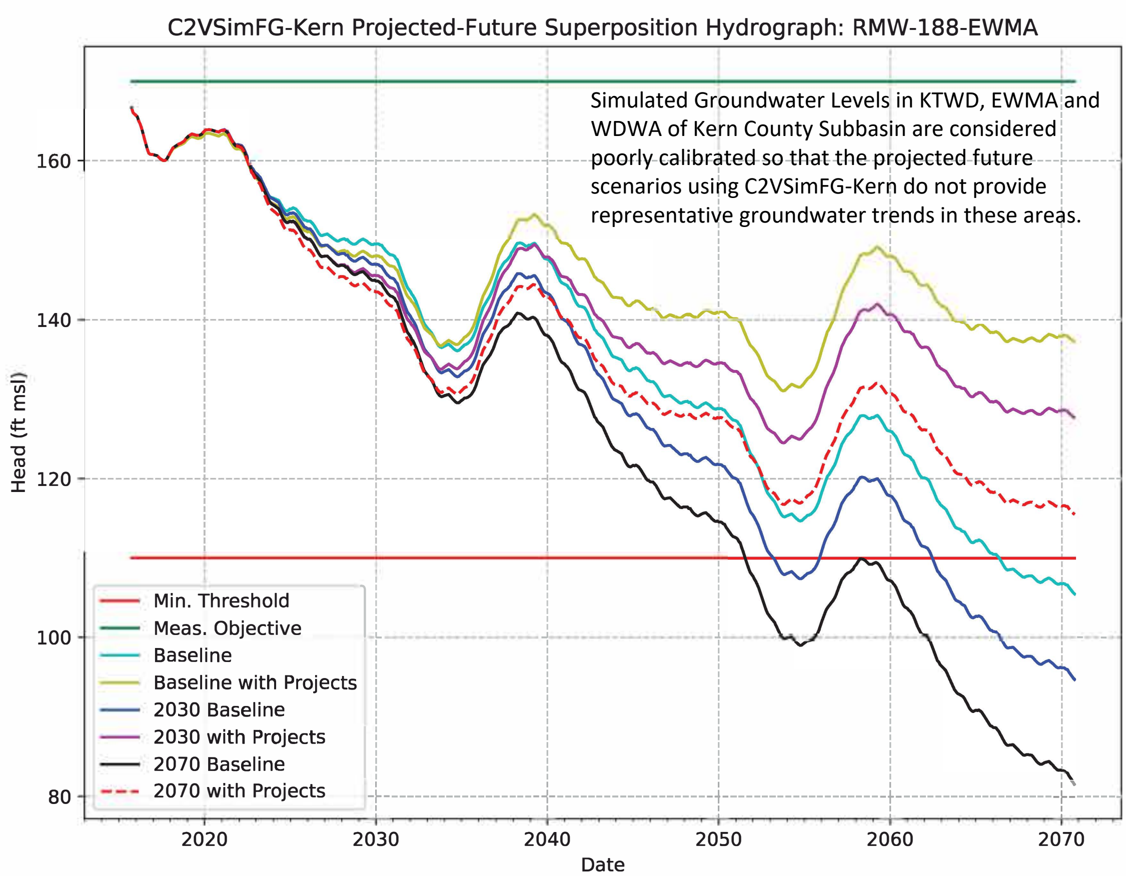


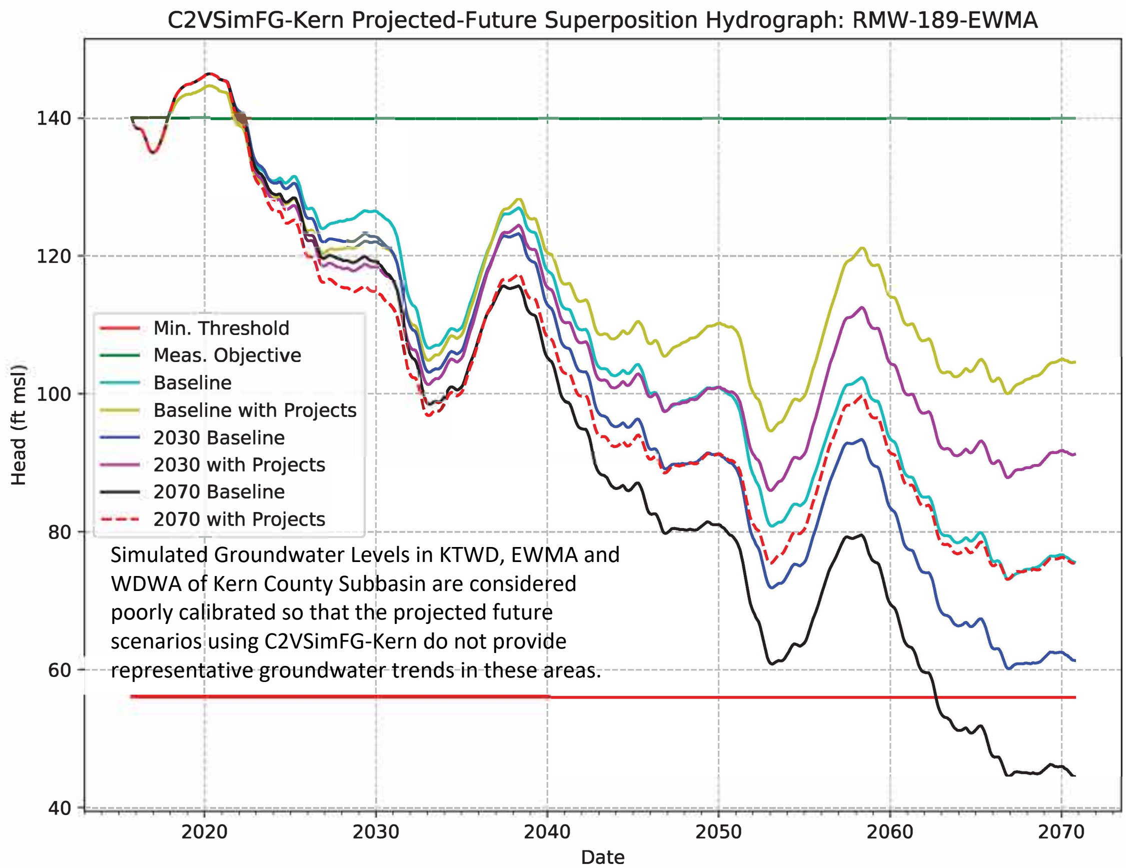
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-184-EWMA
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
40
20
0
−20
−40
−60
−80
−100
2020
2030
2040
2050
2060
2070

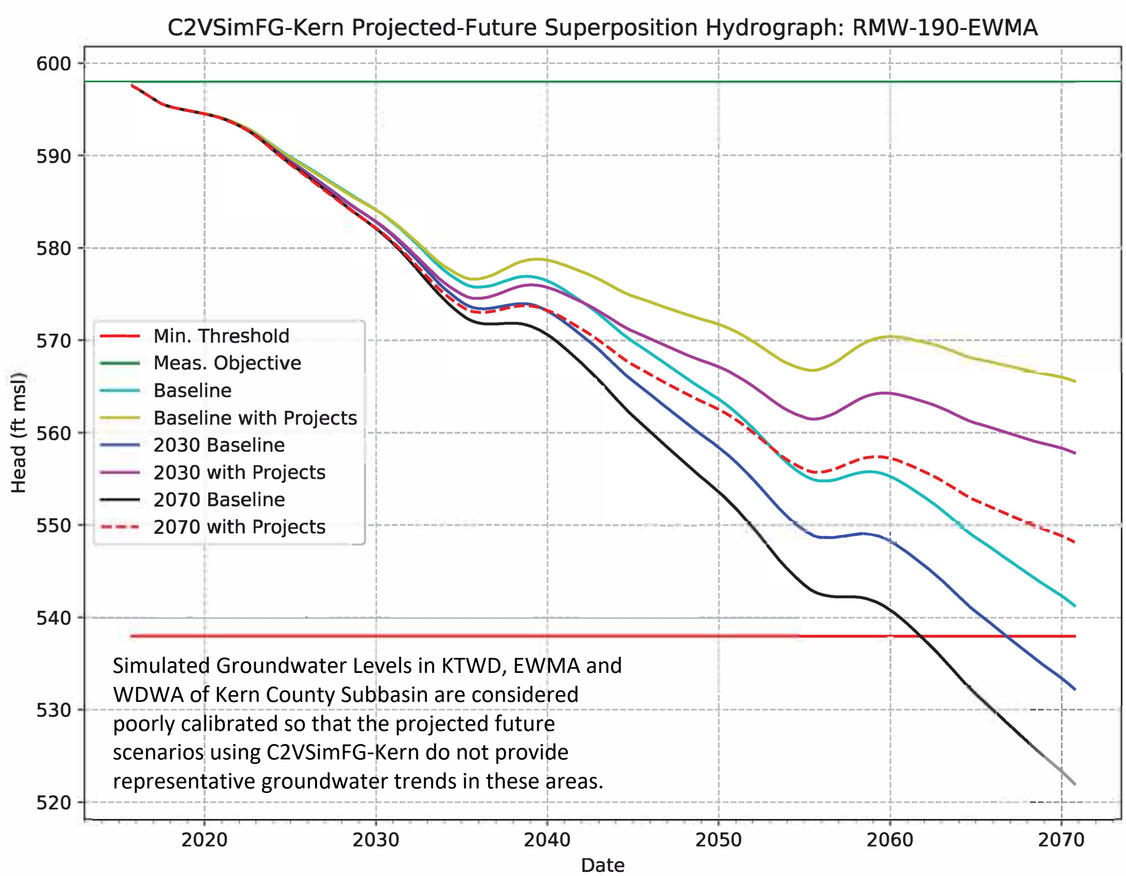



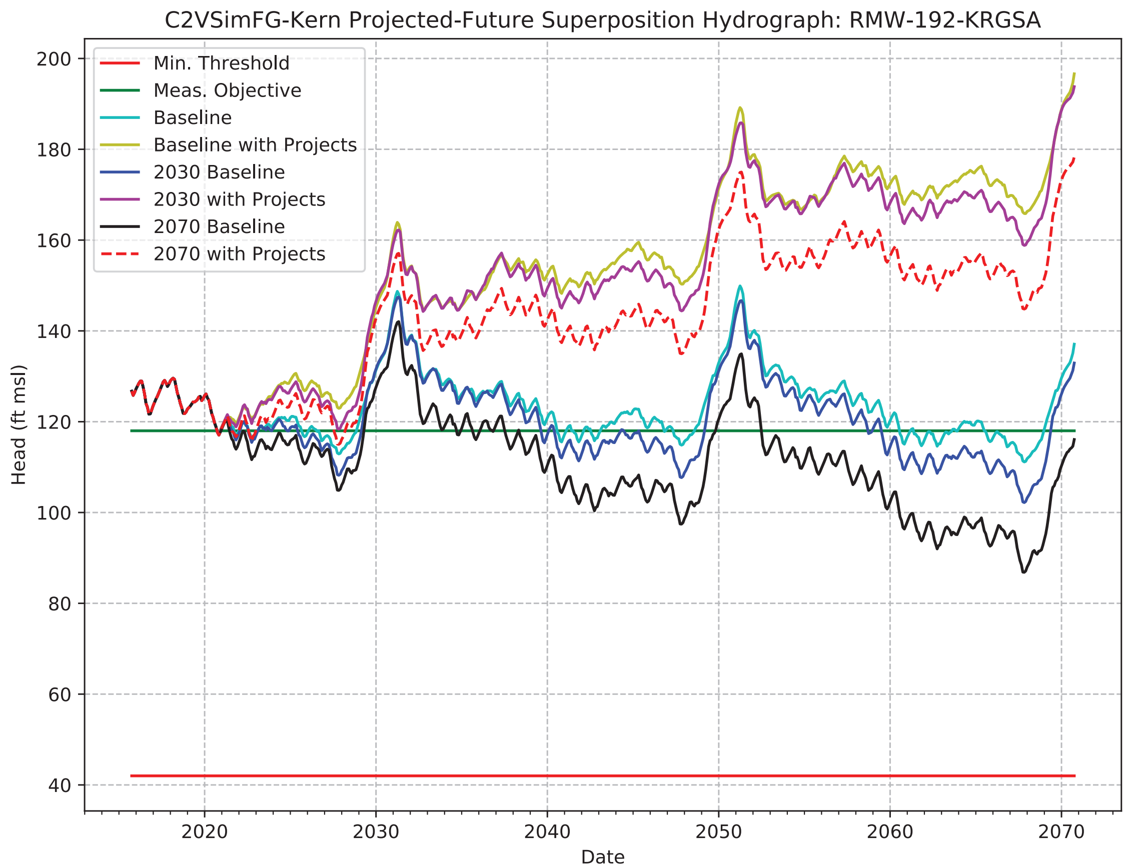
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-185-EWMA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.
Head (ft msl)
Date
120
100
80
60
40
20
2020
2030
2040
2050
2060
2070

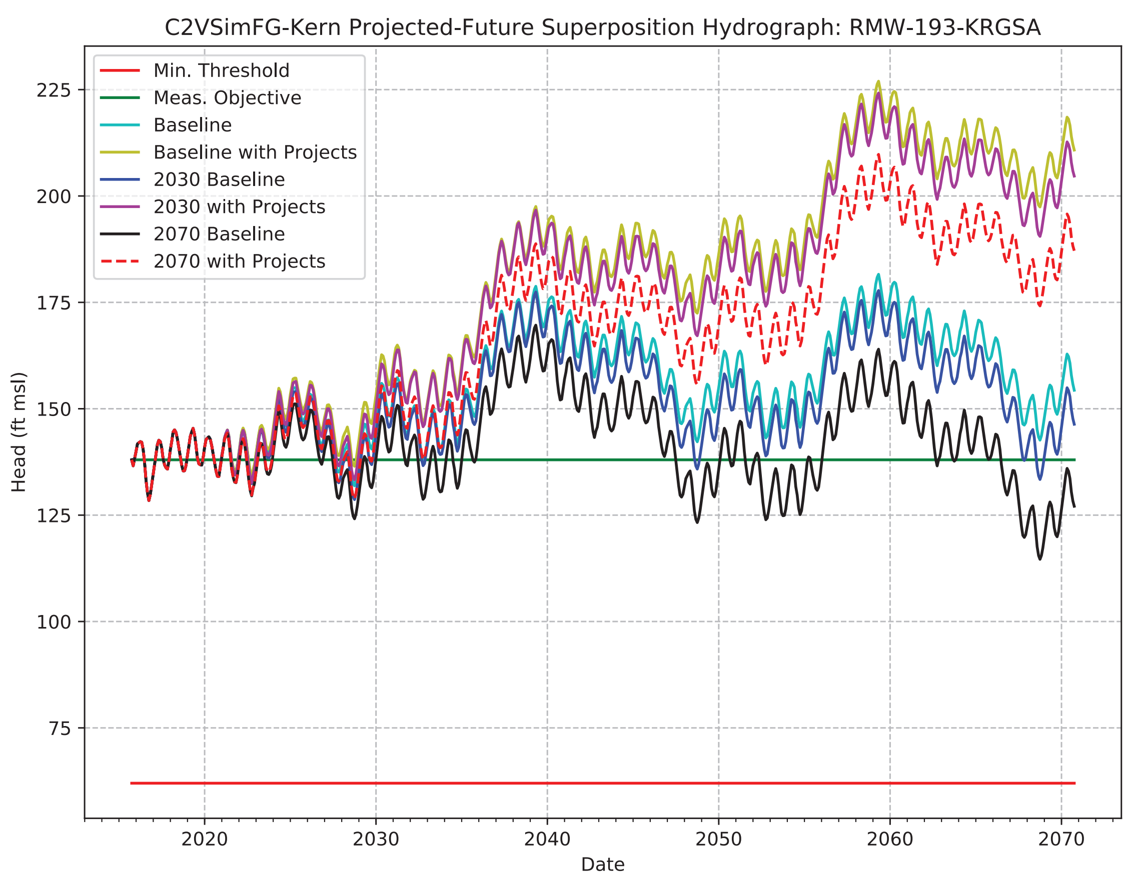

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-187-EWMA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.
Head (ft msl)
0
−20
−40
−60
−80
−100
−120
−140
2020
2030
2040
2050
2060
2070
Date

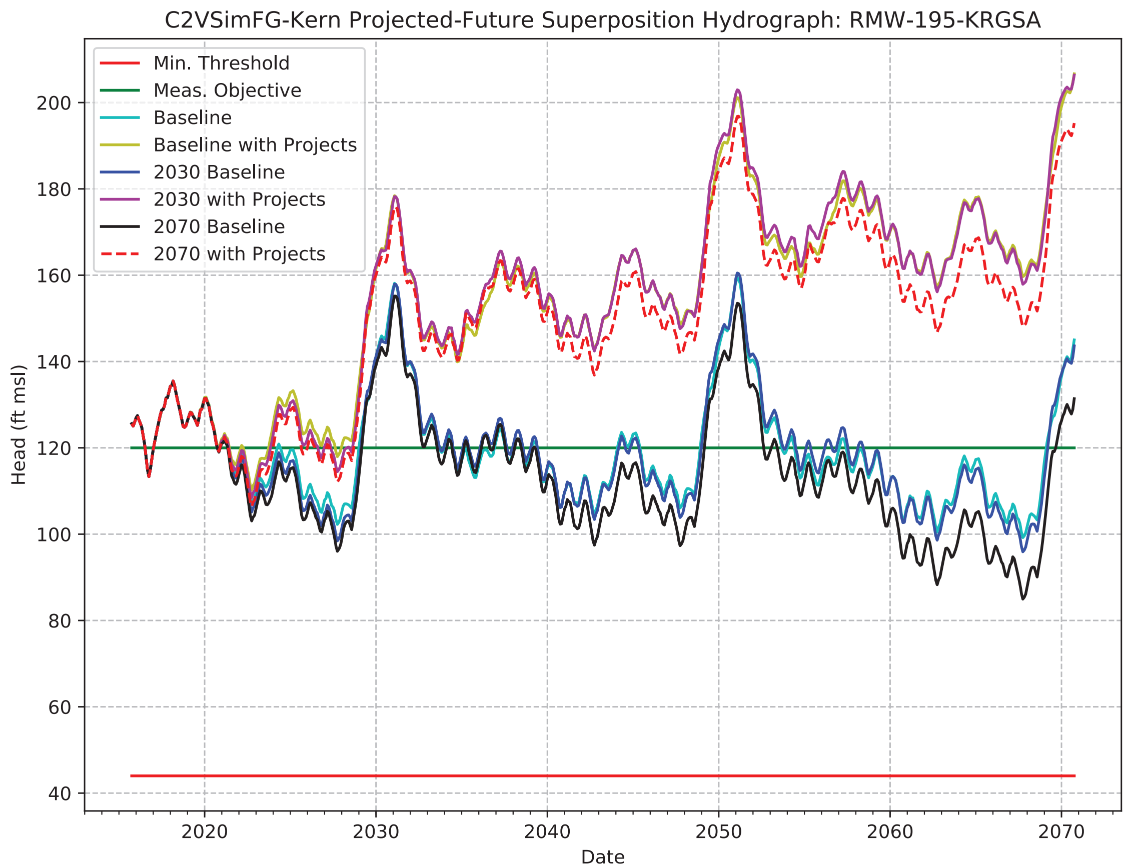

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-188-EWMA
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
160
140
120
100
80
2020
2030
2040
2050
2060
2070
Date

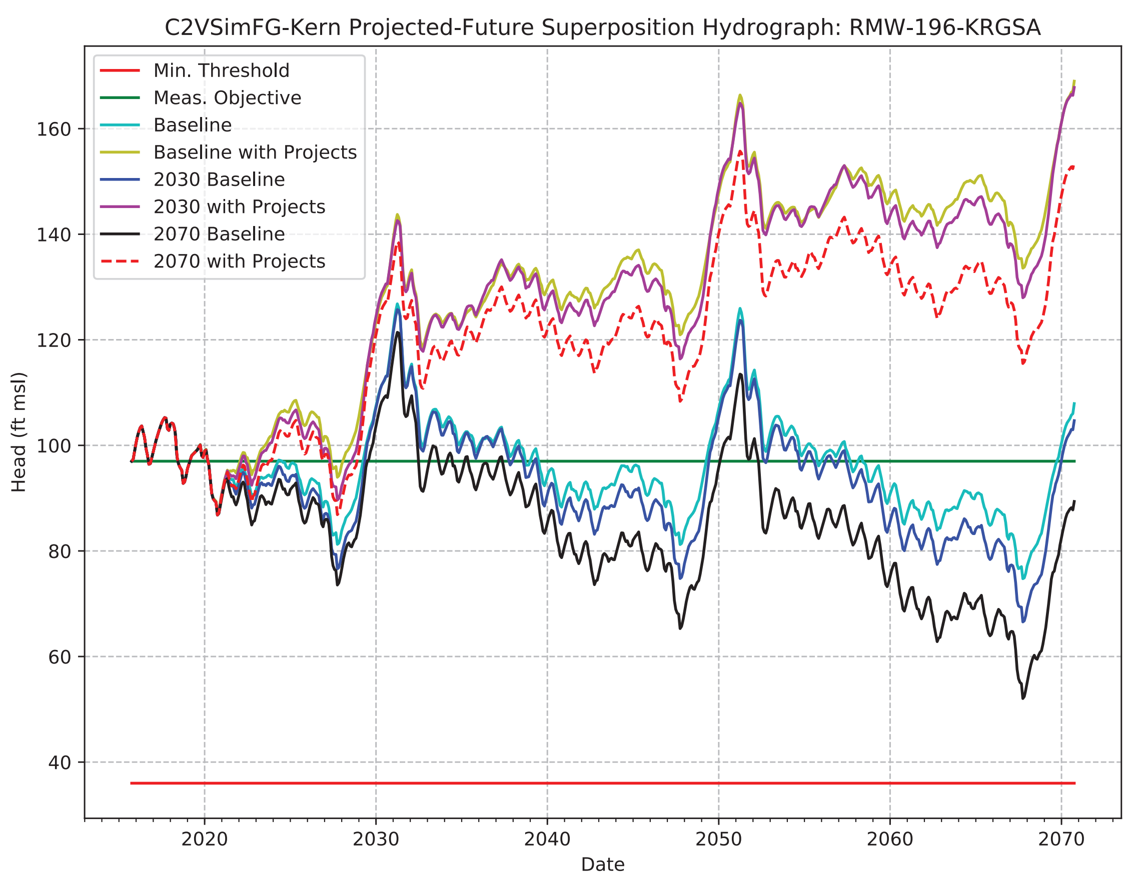

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-189-EWMA
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.

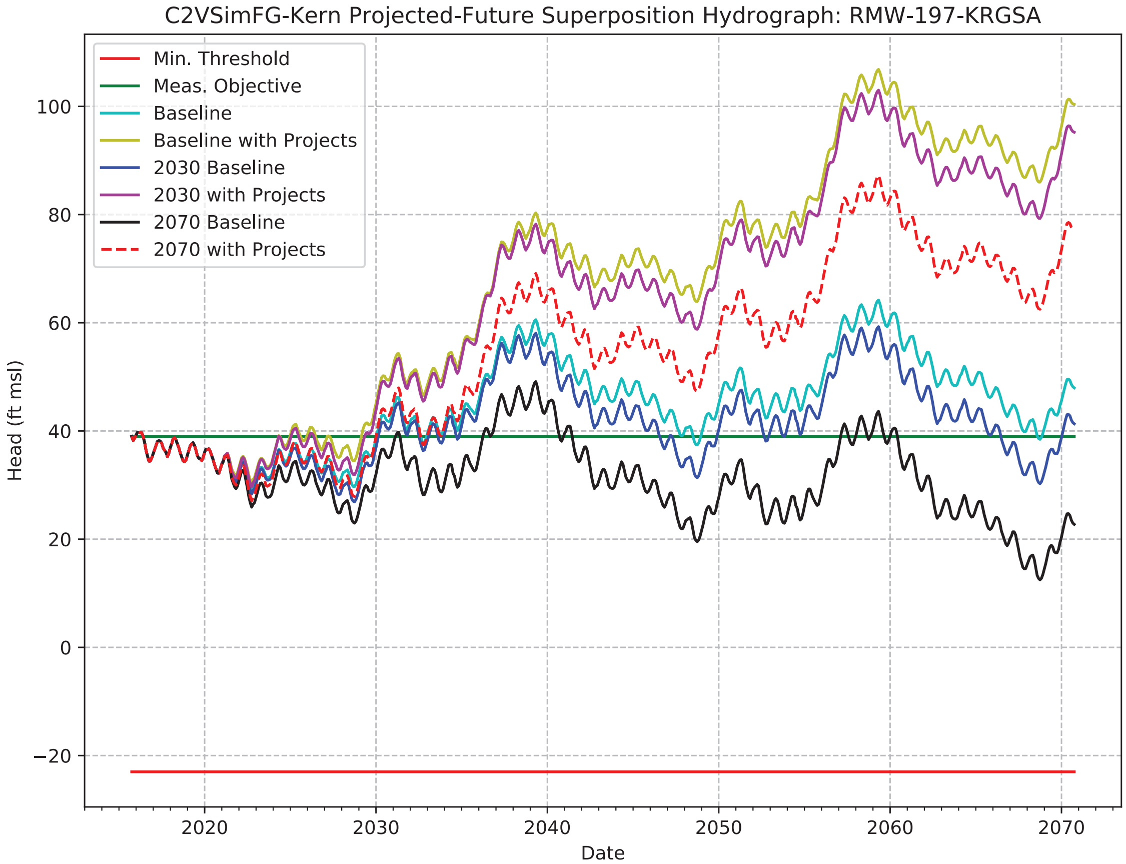

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-190-EWMA
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-192-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
200
180
160
140
120
100
80
60
40
2020
2030
2040
2050
2060
2070

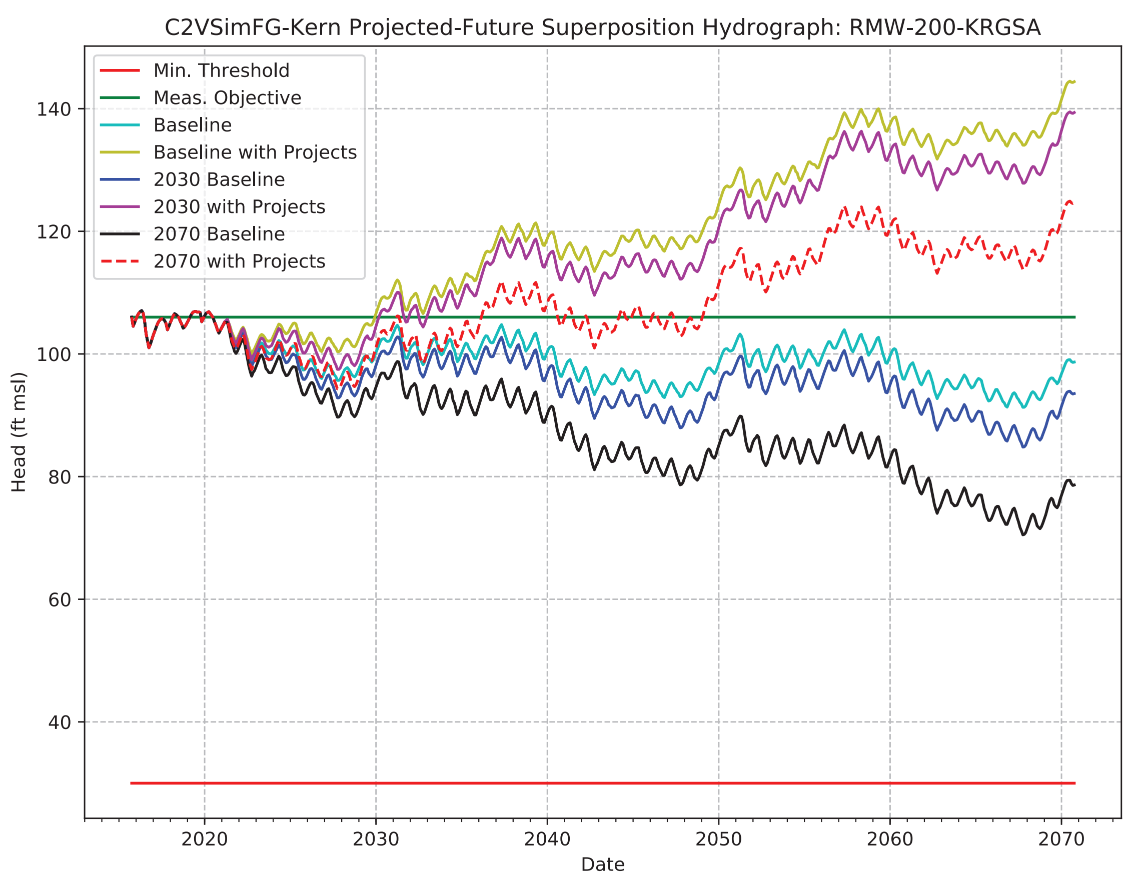

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-193-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
225
200
175
150
125
100
75
2020
2030
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-195-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
200
180
160
140
120
100
80
60
40
2020
2030
2040
2050
2060
2070

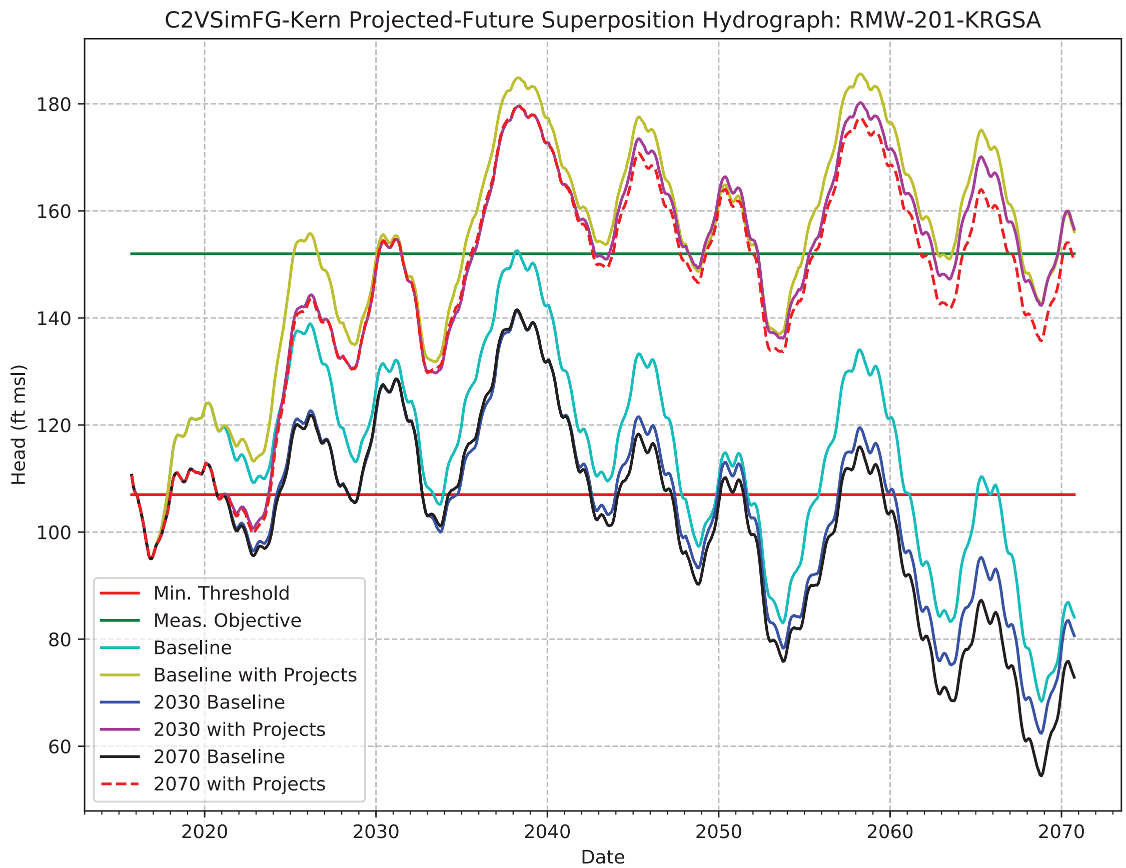

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-196-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
160
140
120
100
80
60
40
2020
2030
2040
2050
2060
2070

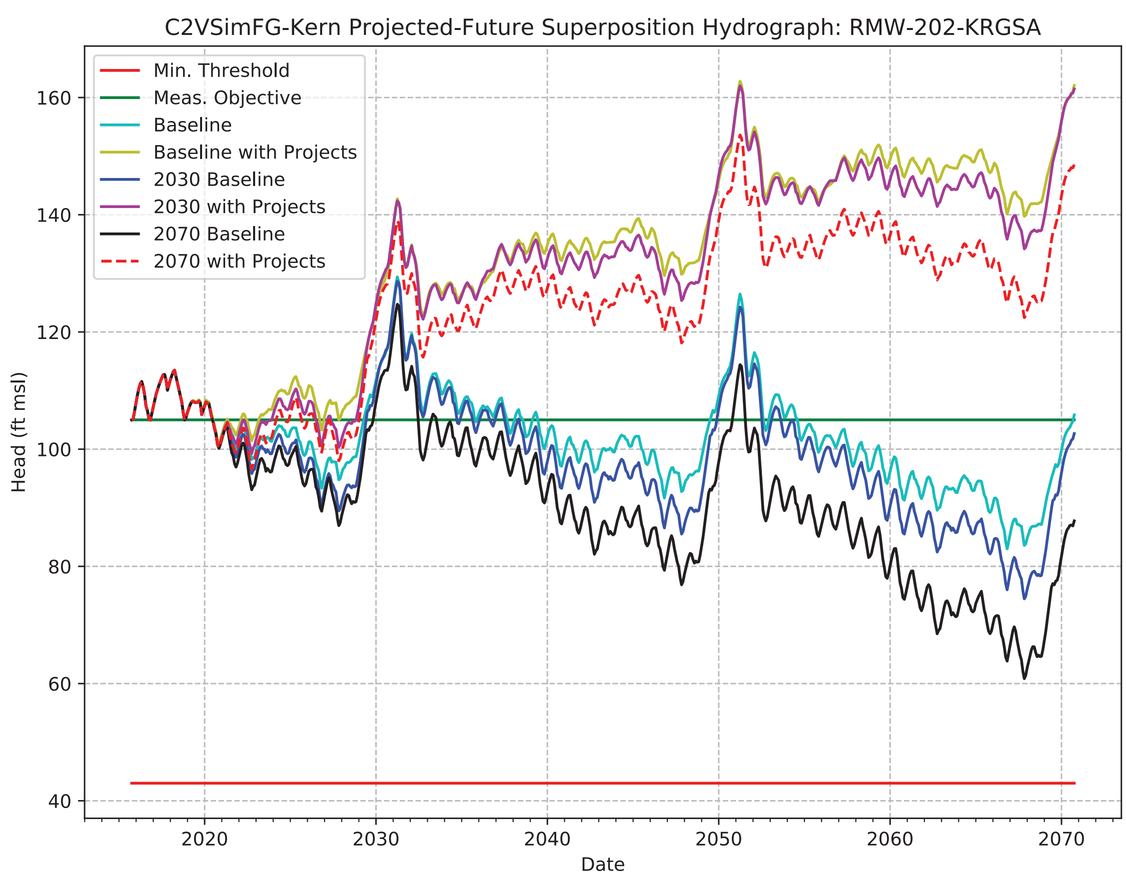


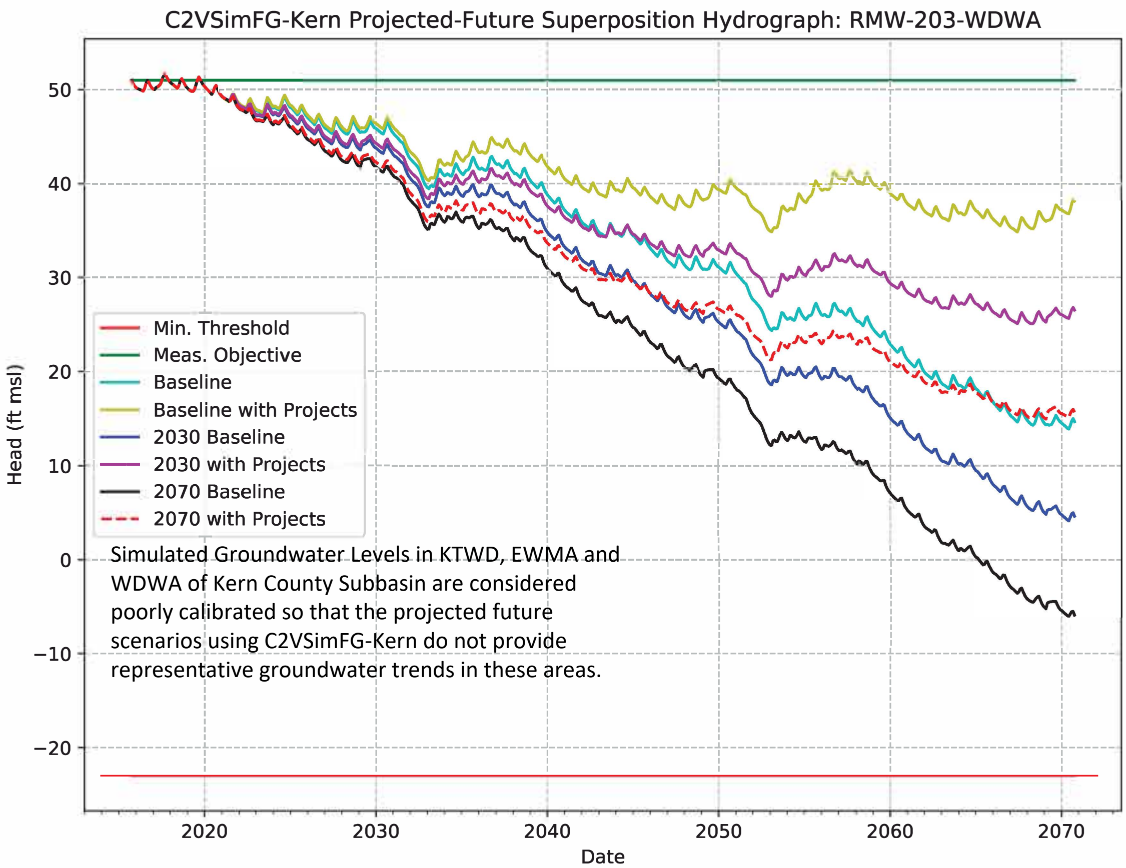
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-197-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
100
80
60
40
20
0
−20
Head (ft msl)
2020
2030
2040
2050
2060
2070
Date

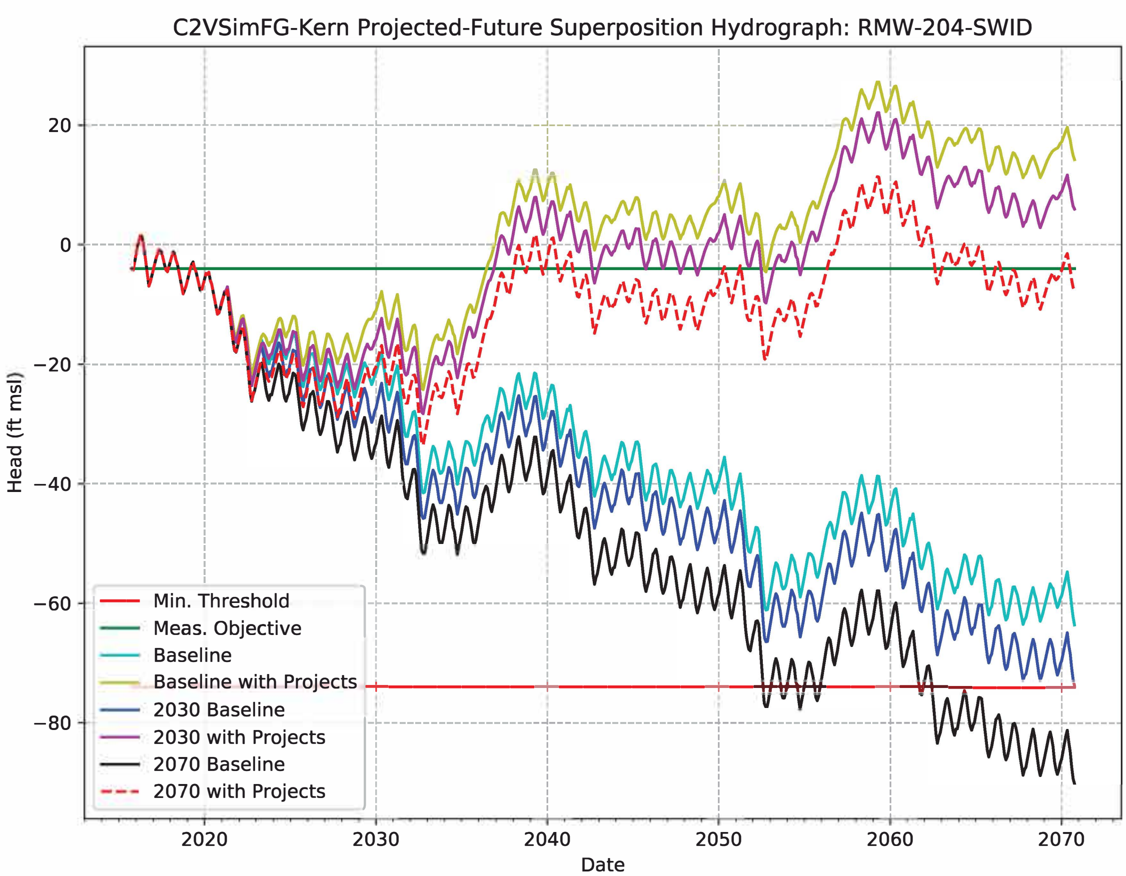
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-200-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
140
120
100
80
60
40
Head (ft msl)
2020
2030
2040
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-201-KRGSA
Head (ft msl)
Date
180
160
140
120
100
80
60
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-202-KRGSA
Head (ft msl)
Date
160
140
120
100
80
60
40
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

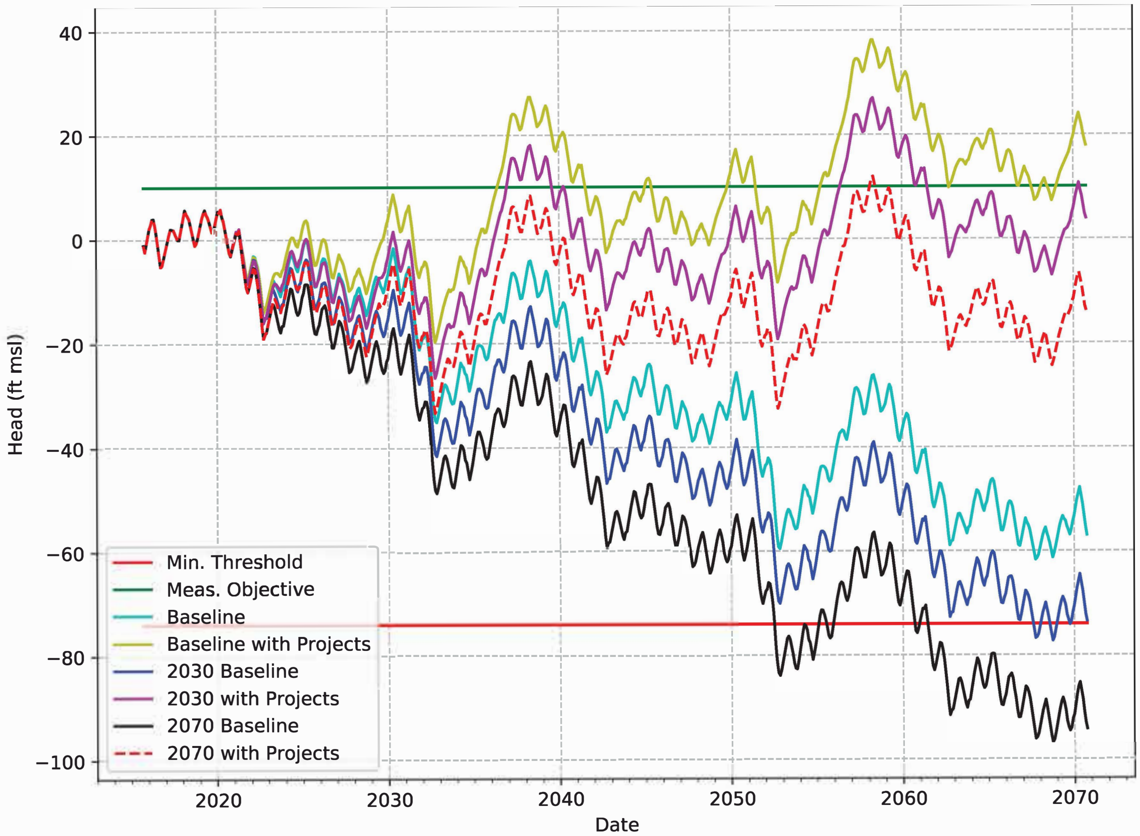


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-203-WDWA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Simulated Groundwater Levels in KTWD, EWMA and WDWA of Kern County Subbasin are considered poorly calibrated so that the projected future scenarios using C2VSimFG-Kern do not provide representative groundwater trends in these areas.
Head (ft msl)
Date
50
40
30
20
10
0
−10
−20
2020
2030
2040
2050
2060
2070

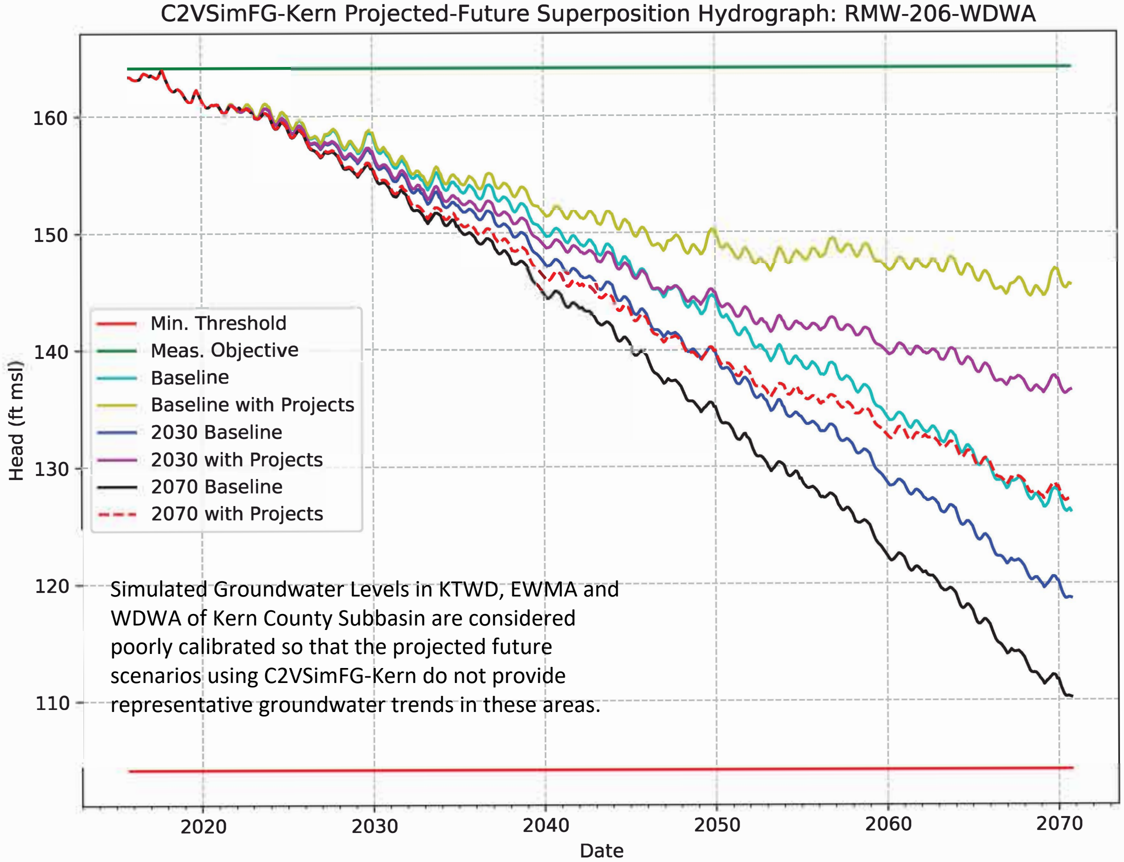



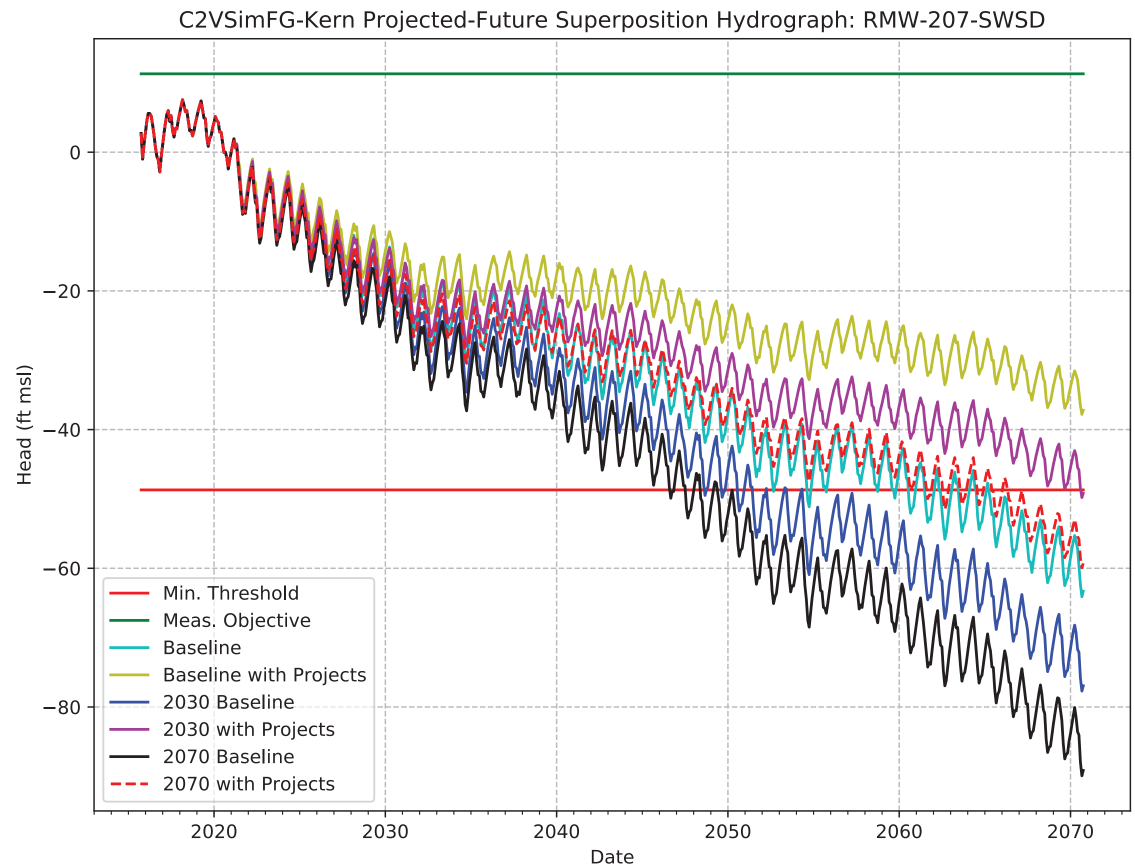
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-204-SWID
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
20
0
−20
−40
−60
−80
2020
2030
2040
2050
2060
2070

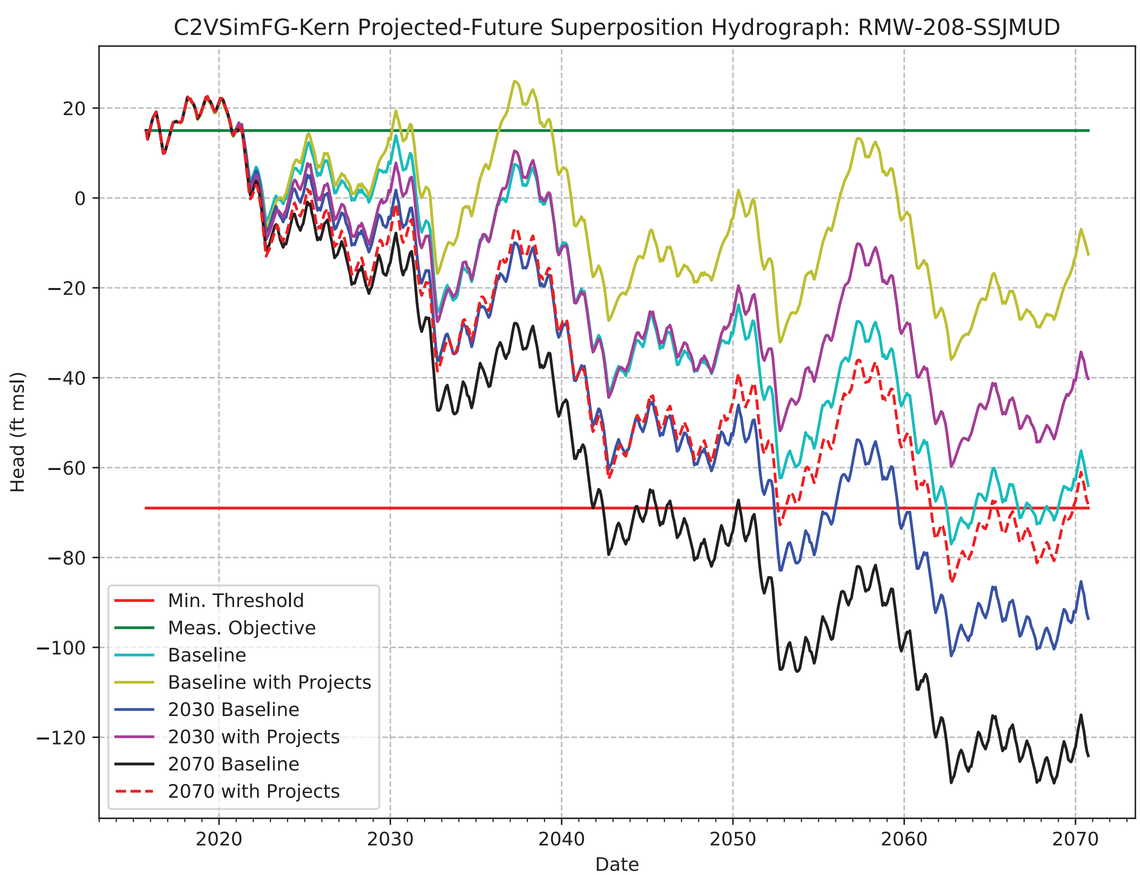
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-205-SWID

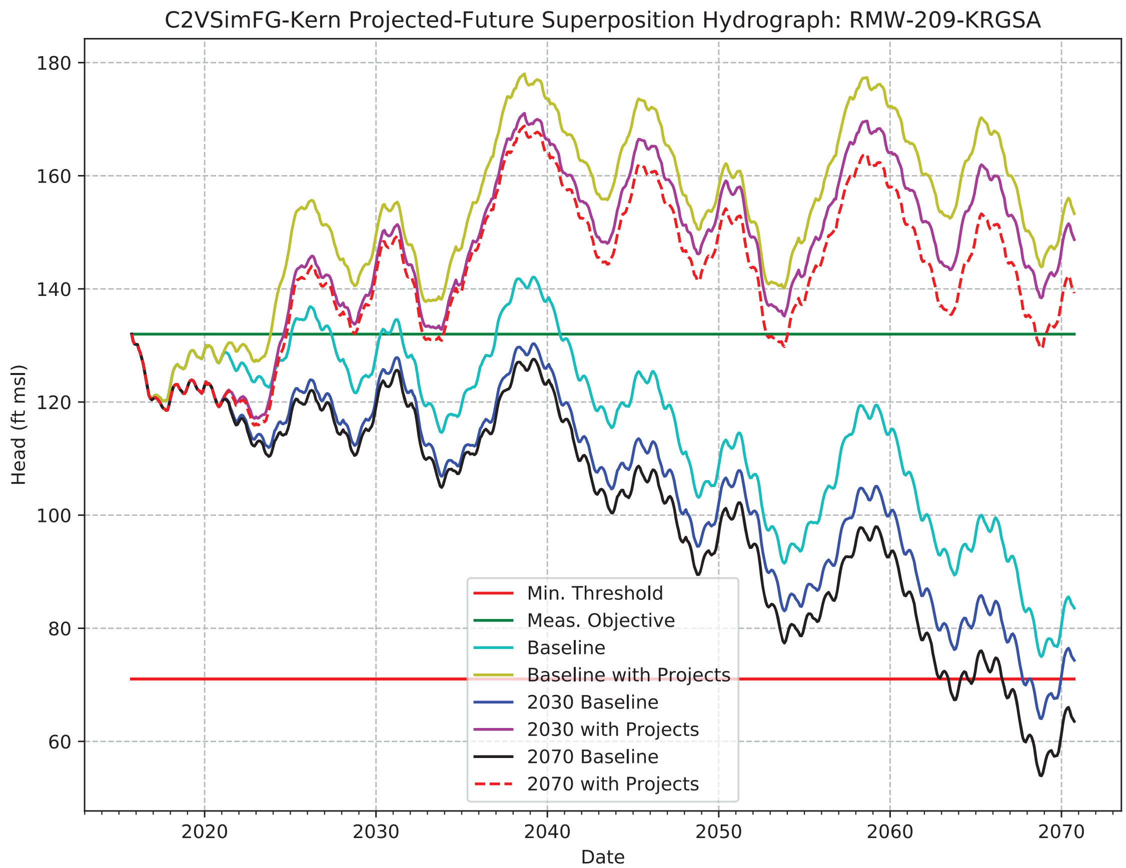


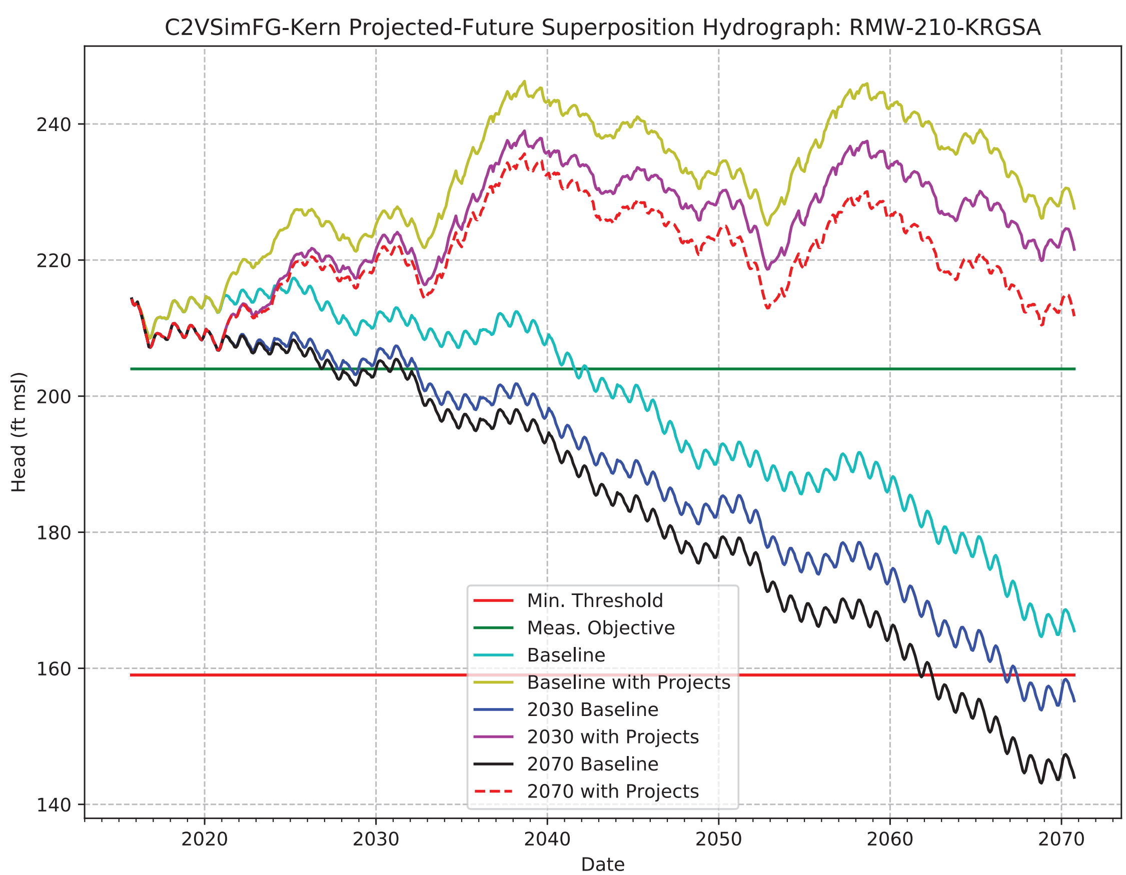

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-206-WDWA

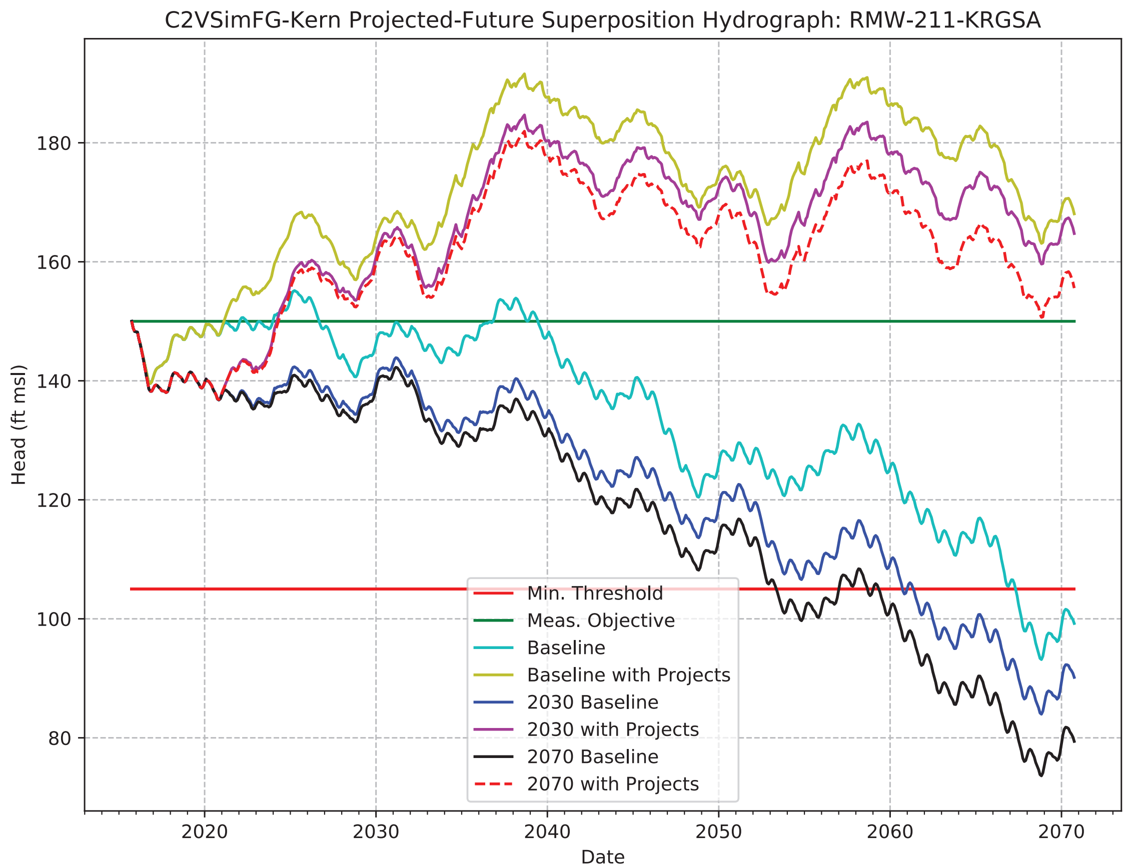


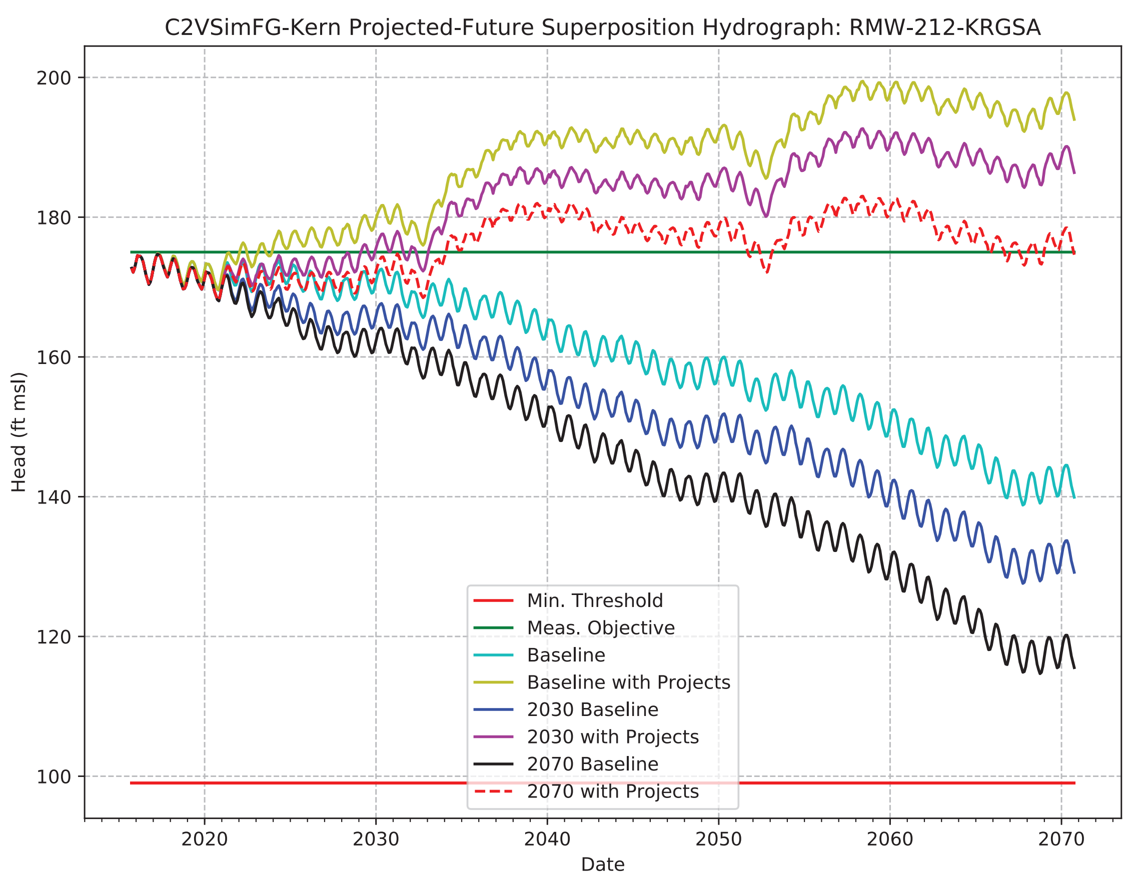

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-207-SWSD
Head (ft msl)
Date
0
−20
−40
−60
−80
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

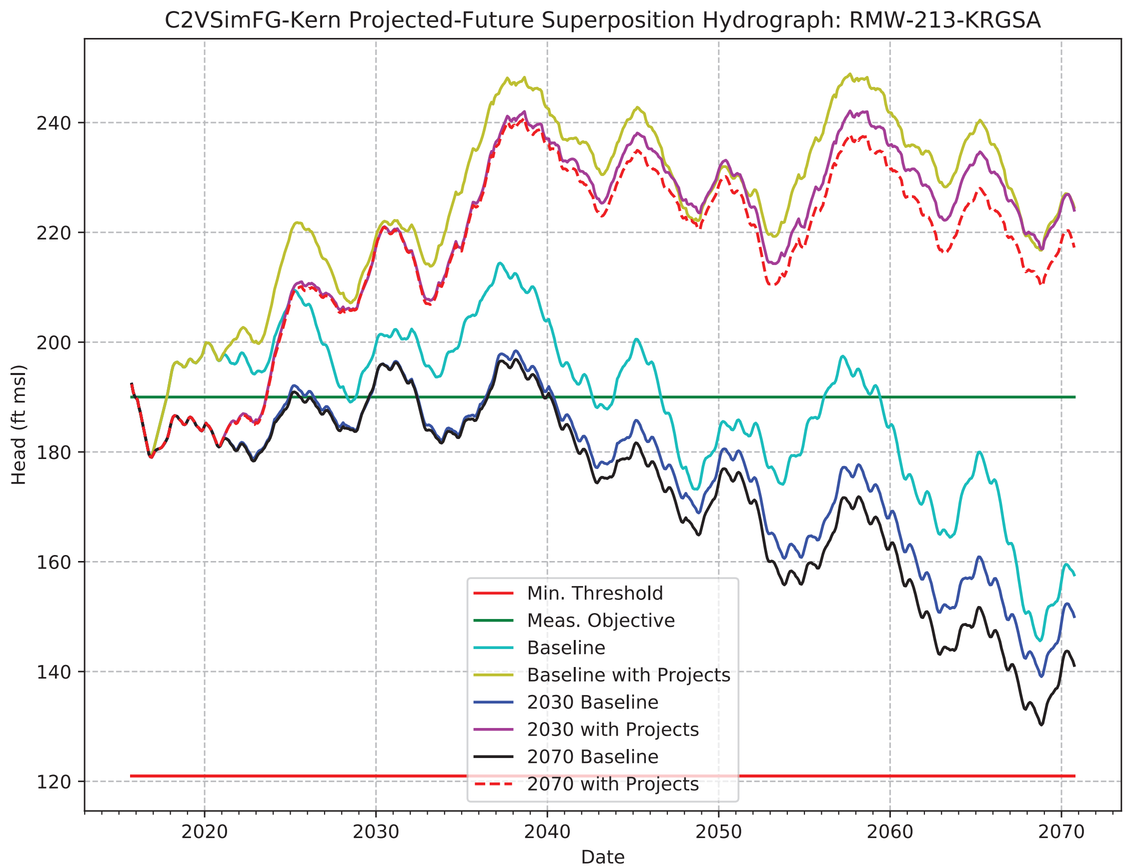

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-208-SSJMUD
Head (ft msl)
Date
20
0
−20
−40
−60
−80
−100
−120
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

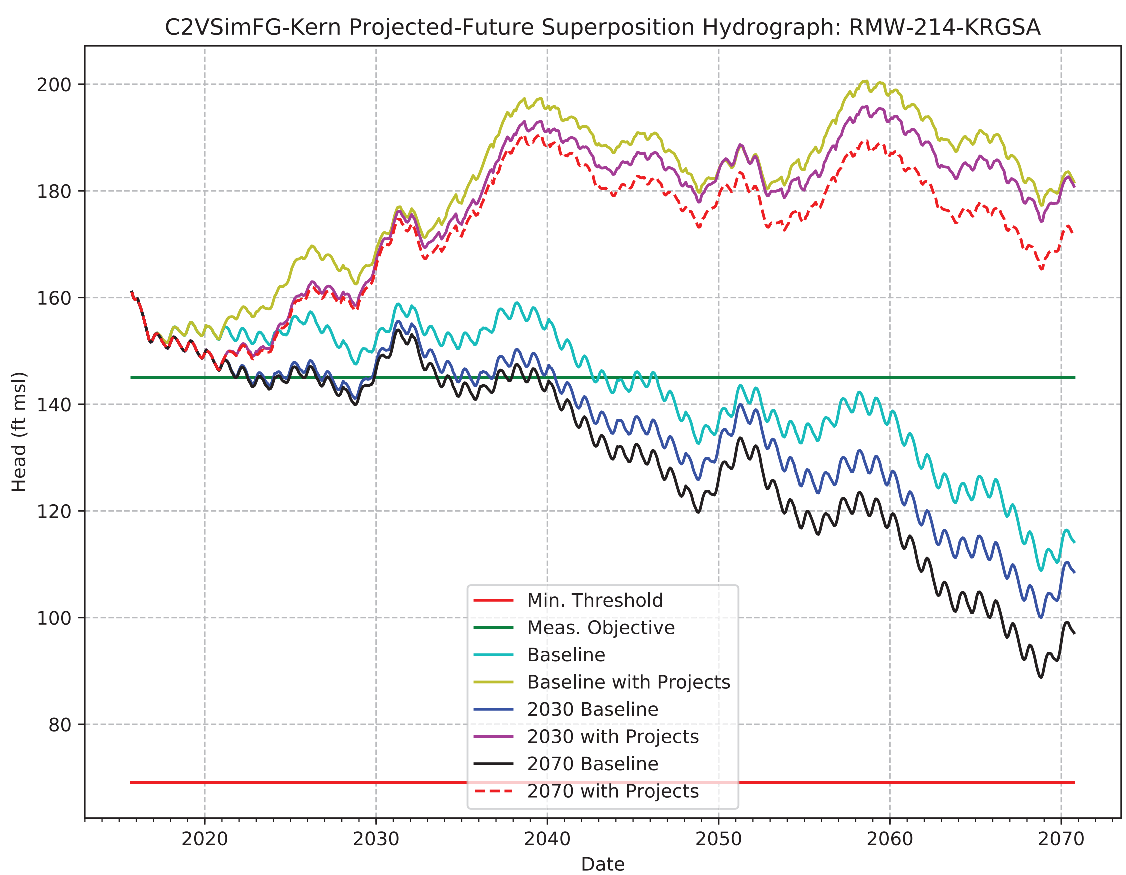

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-209-KRGSA
Head (ft msl)
Date
180
160
140
120
100
80
60
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

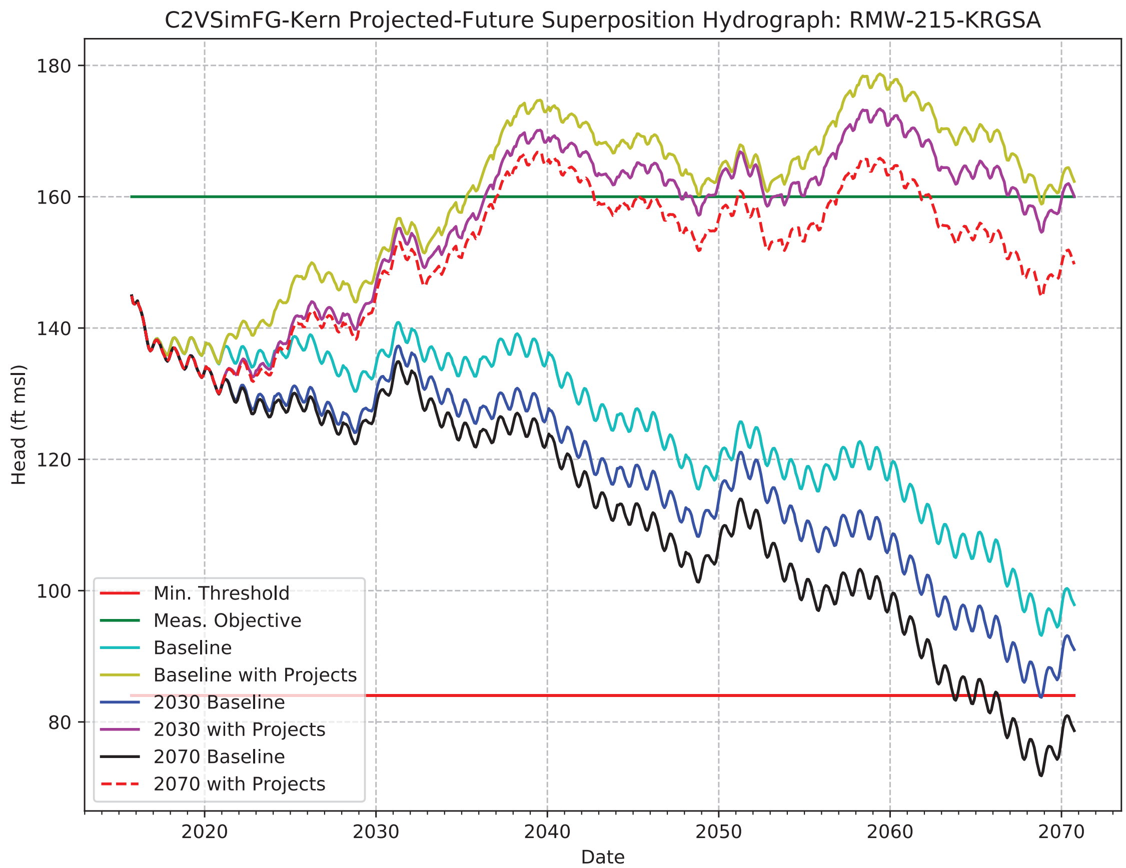

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-210-KRGSA
Head (ft msl)
Date
240
220
200
180
160
140
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

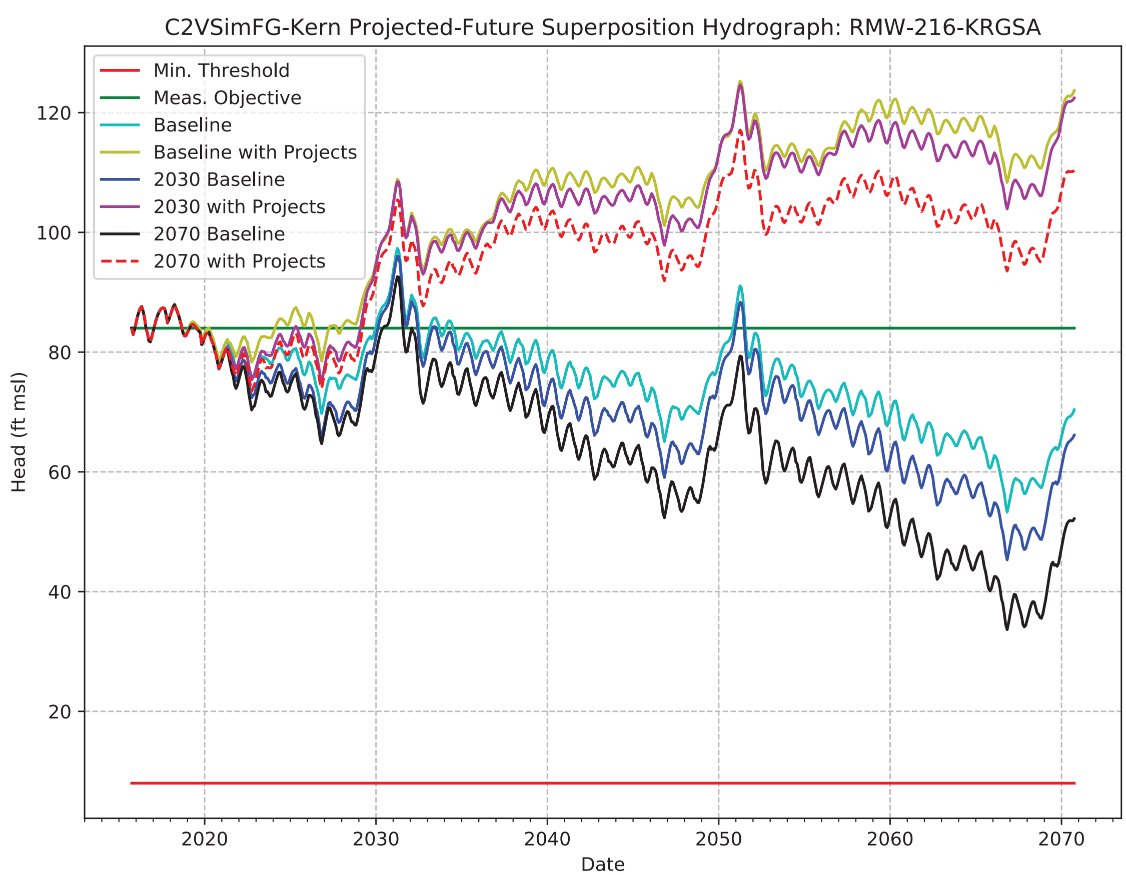

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-211-KRGSA
Head (ft msl)
Date
180
160
140
120
100
80
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

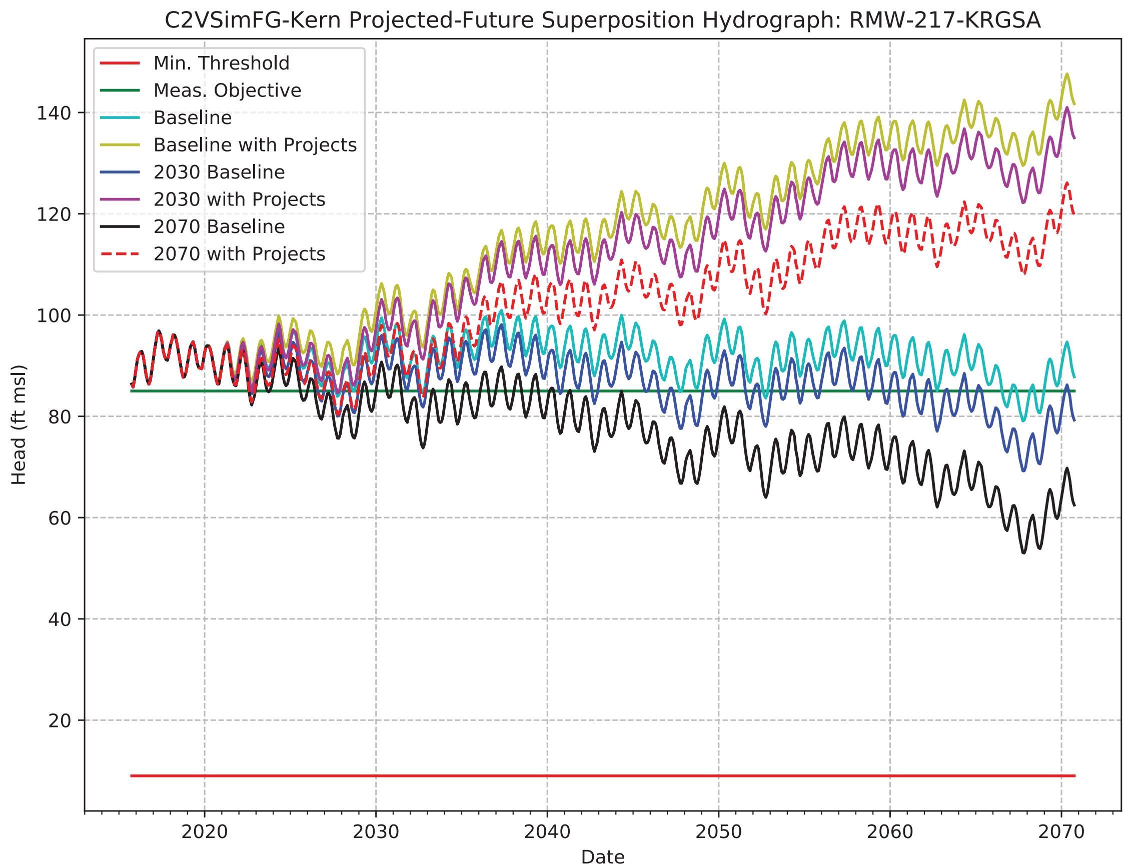

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-212-KRGSA
Head (ft msl)
Date
200
180
160
140
120
100
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-213-KRGSA
Head (ft msl)
Date
120
140
160
180
200
220
240
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

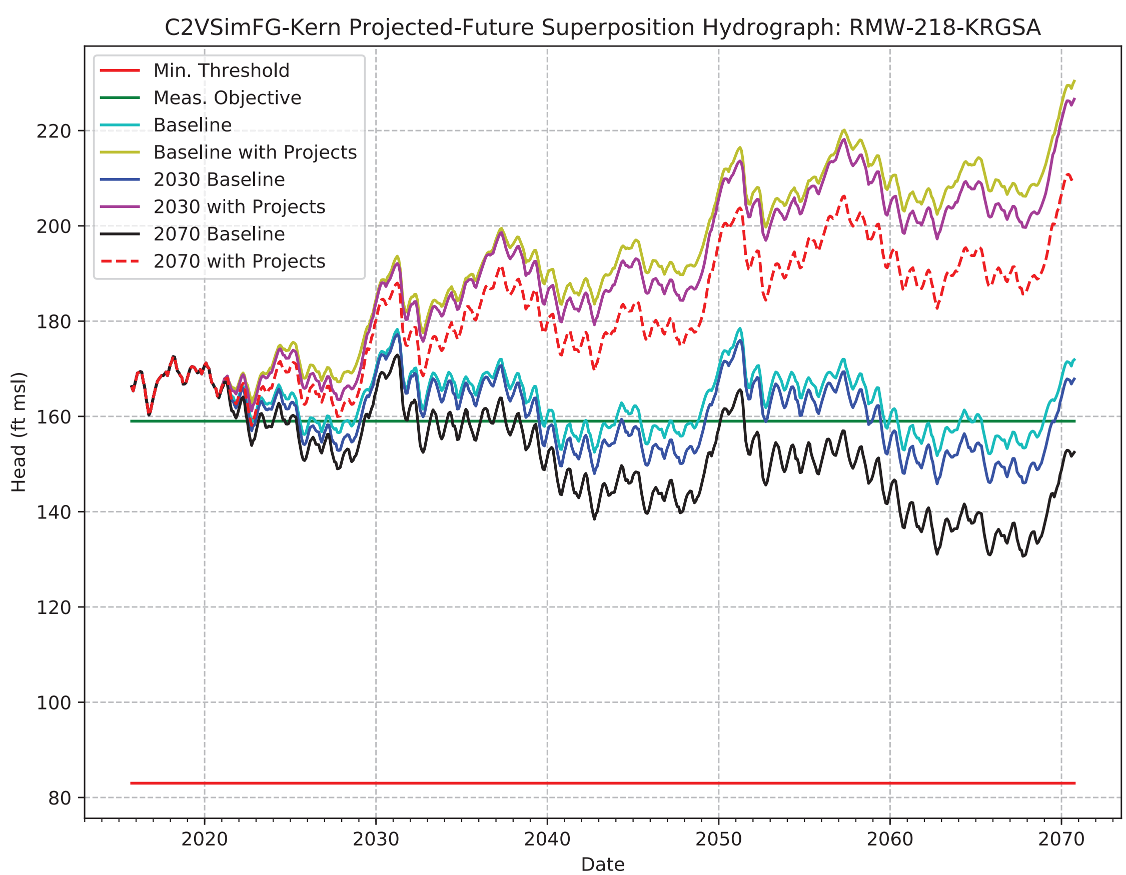

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-214-KRGSA
Head (ft msl)
Date
80
100
120
140
160
180
200
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-215-KRGSA
Head (ft msl)
Date
180
160
140
120
100
80
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

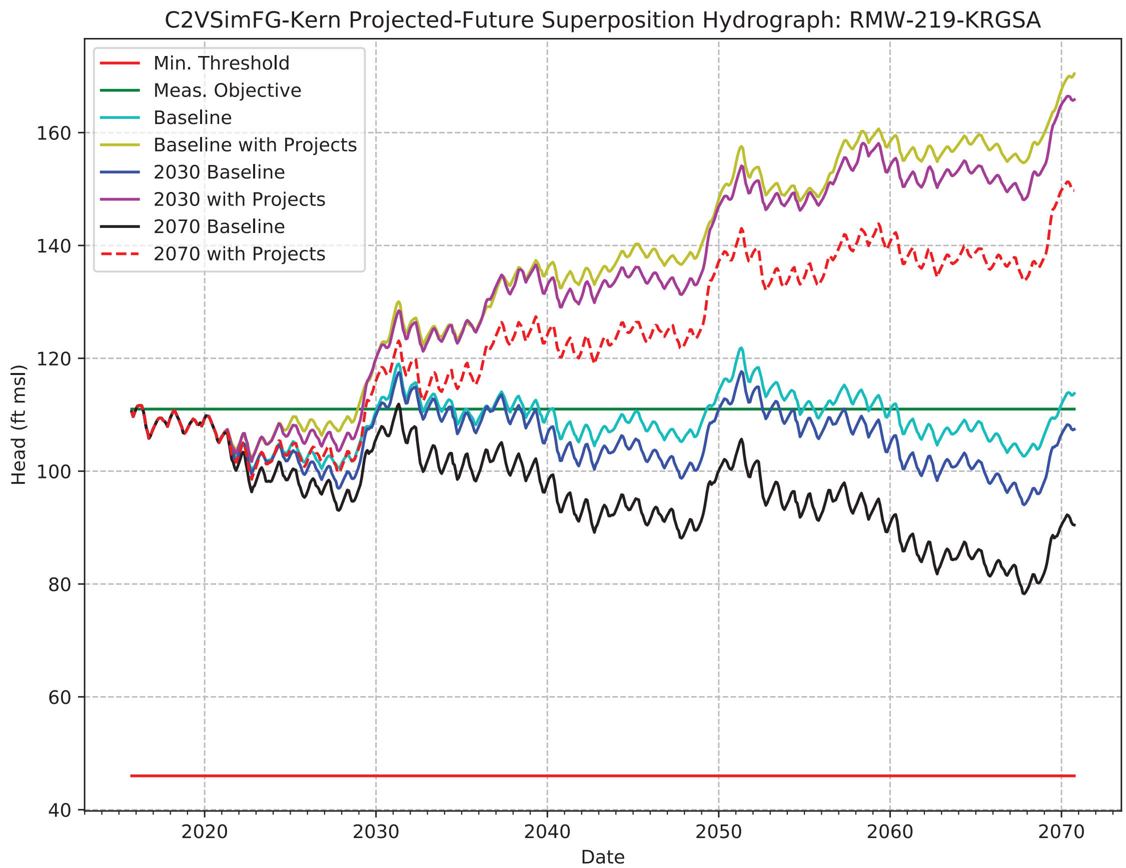

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-216-KRGSA
Head (ft msl)
Date
120
100
80
60
40
20
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

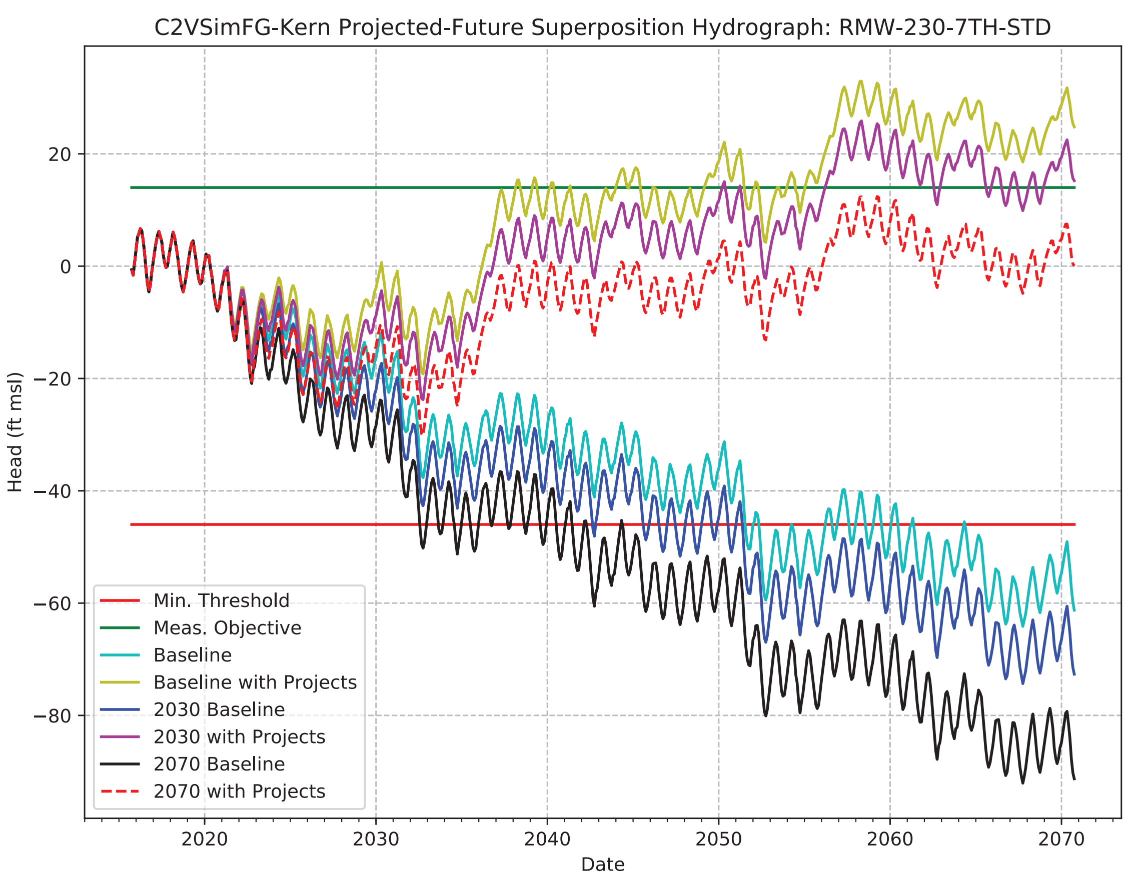


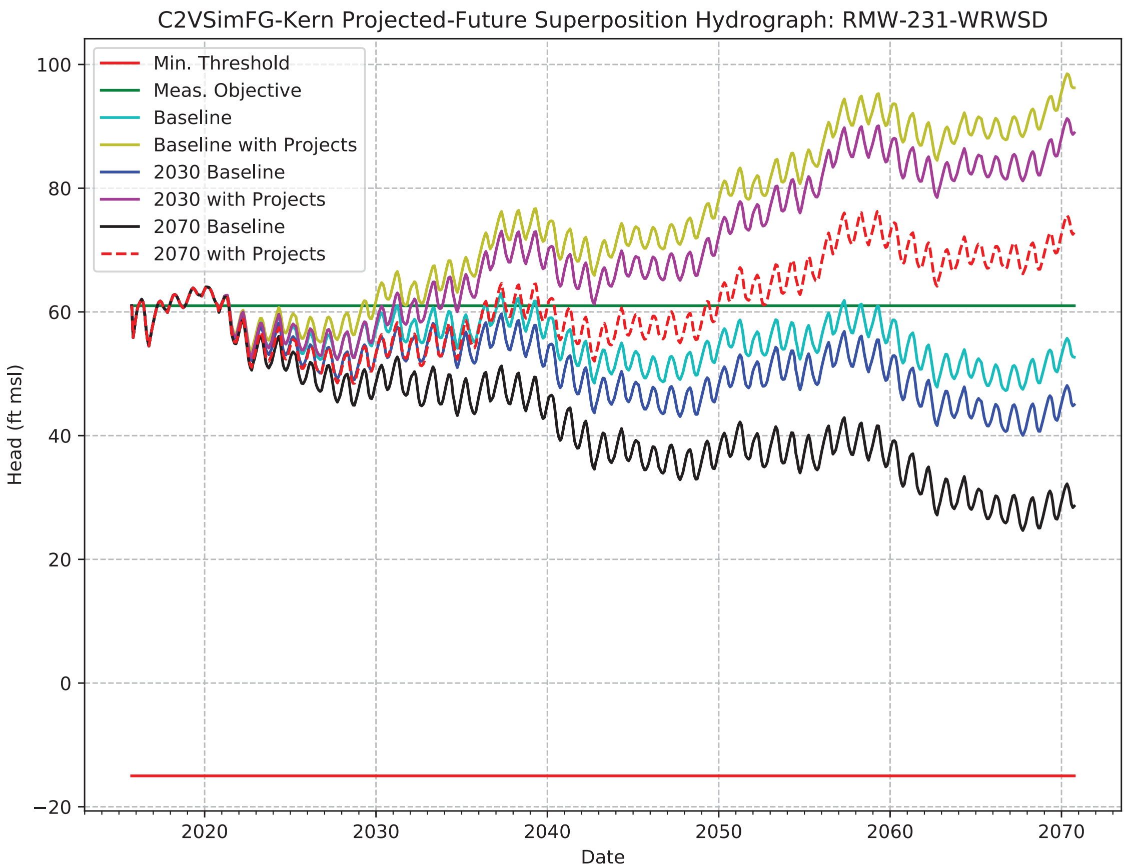
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-217-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
140
120
100
80
60
40
20
2020
2030
2040
2050
2060
2070
Date

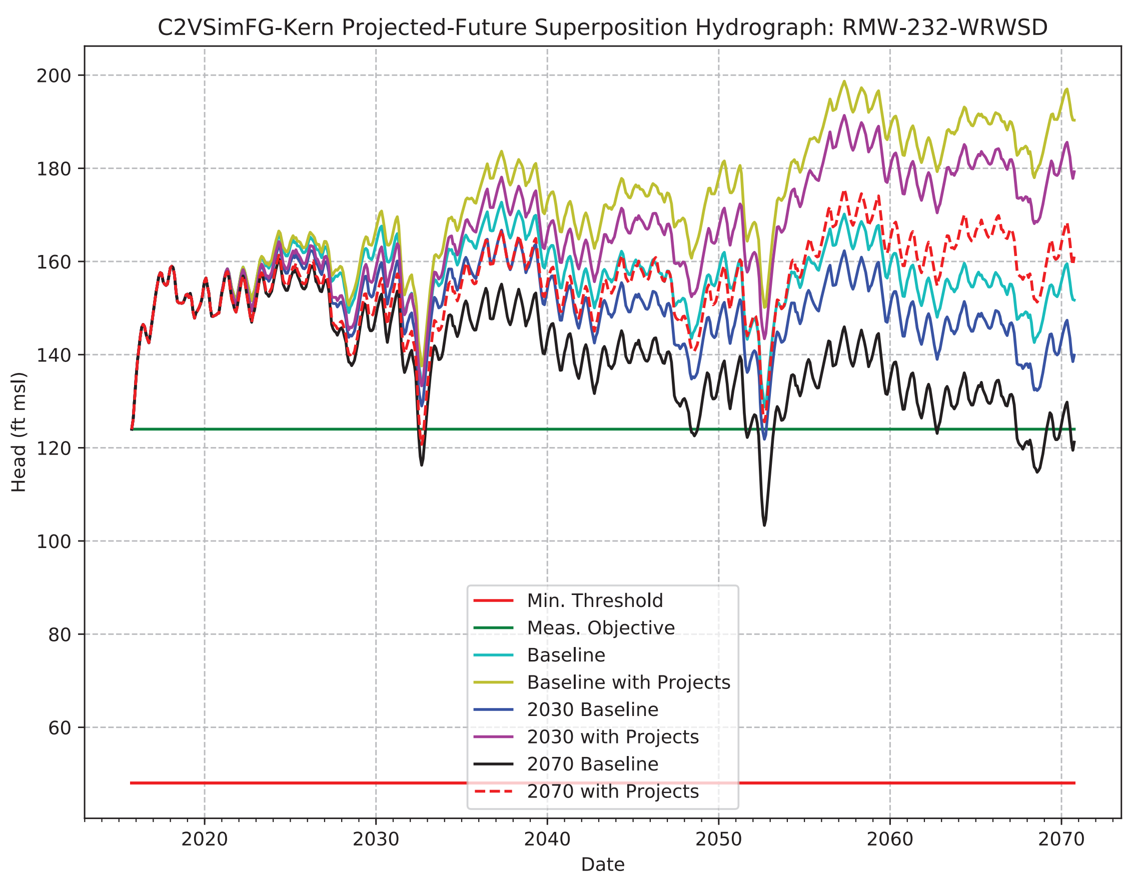



C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-218-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
220
200
180
160
140
120
100
80
2020
2030
2040
2050
2060
2070
Date


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-219-KRGSA
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
40
60
80
100
120
140
160
2020
2030
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-230-7TH-STD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
−80
−60
−40
−20
0
20
2020
2030
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-231-WRWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
100
80
60
40
20
0
−20
2020
2030
2040
2050
2060
2070


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-232-WRWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date
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100
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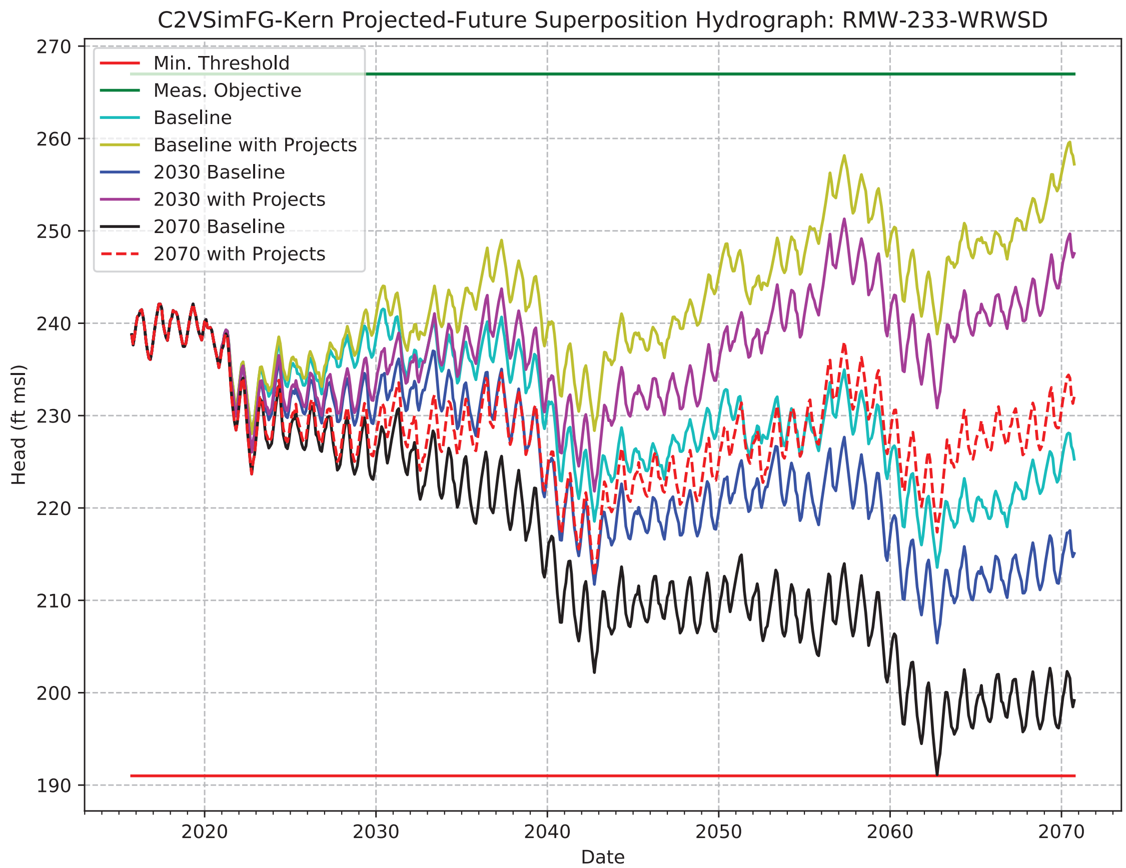
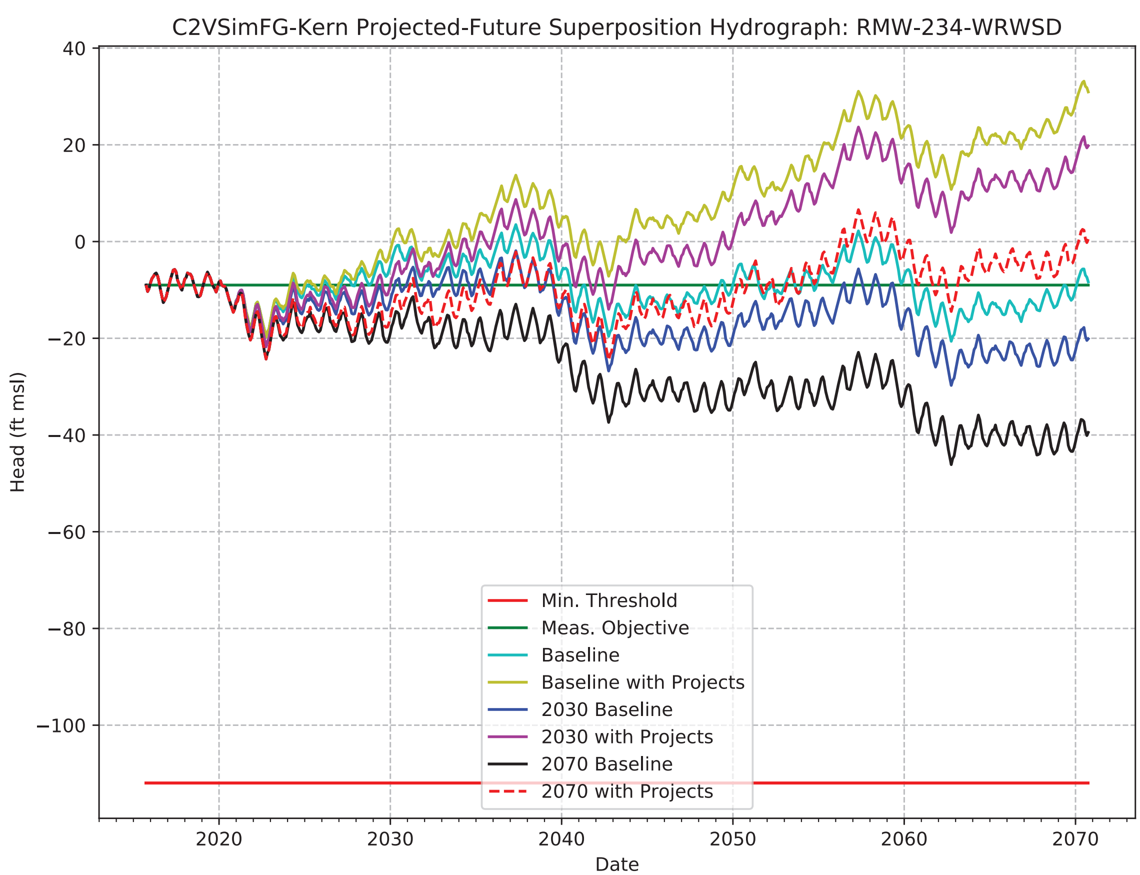
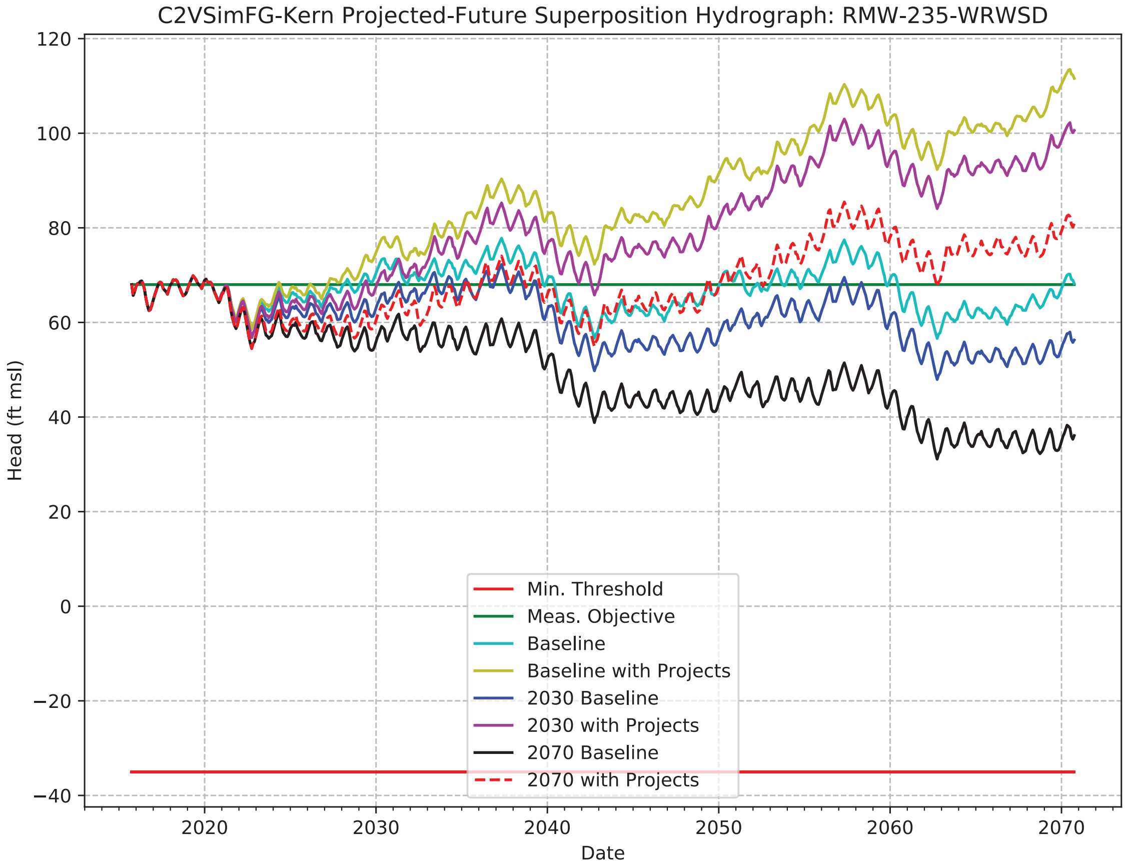
60
2020
2030
2040
2050
2060
2070

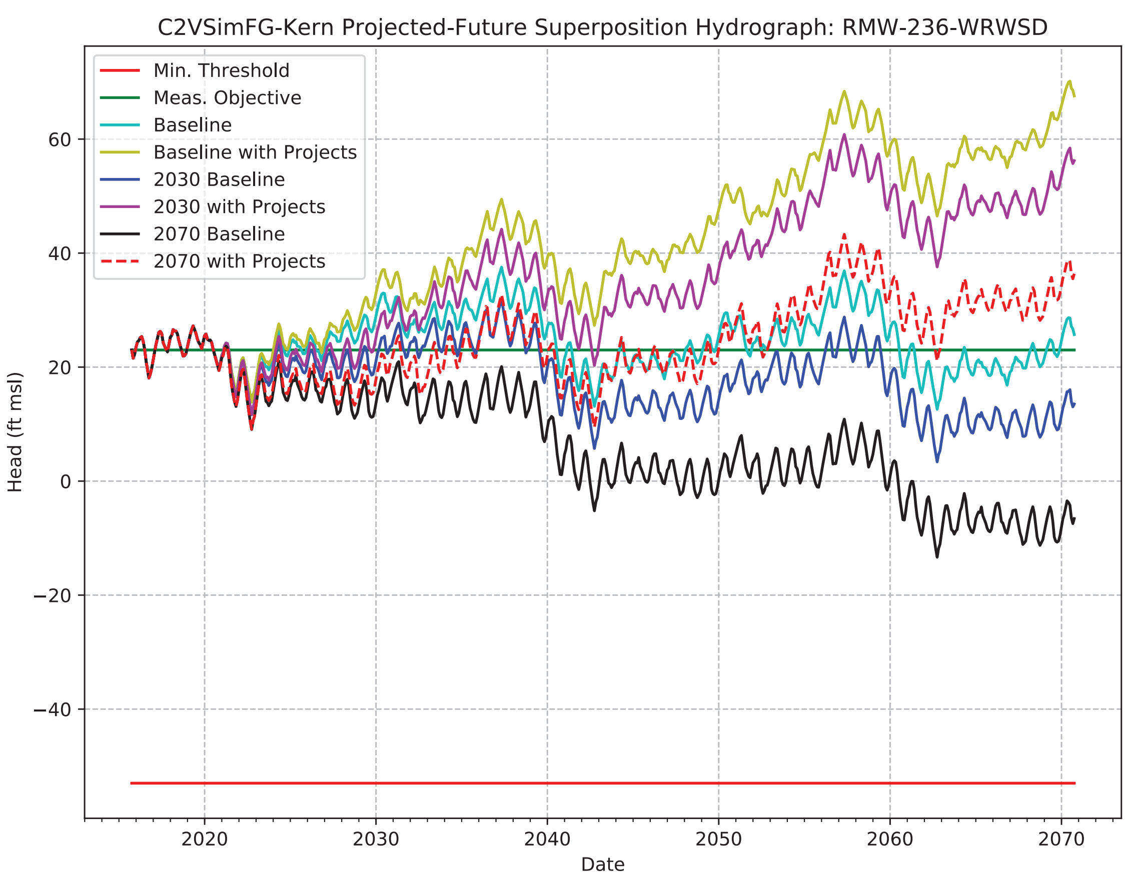


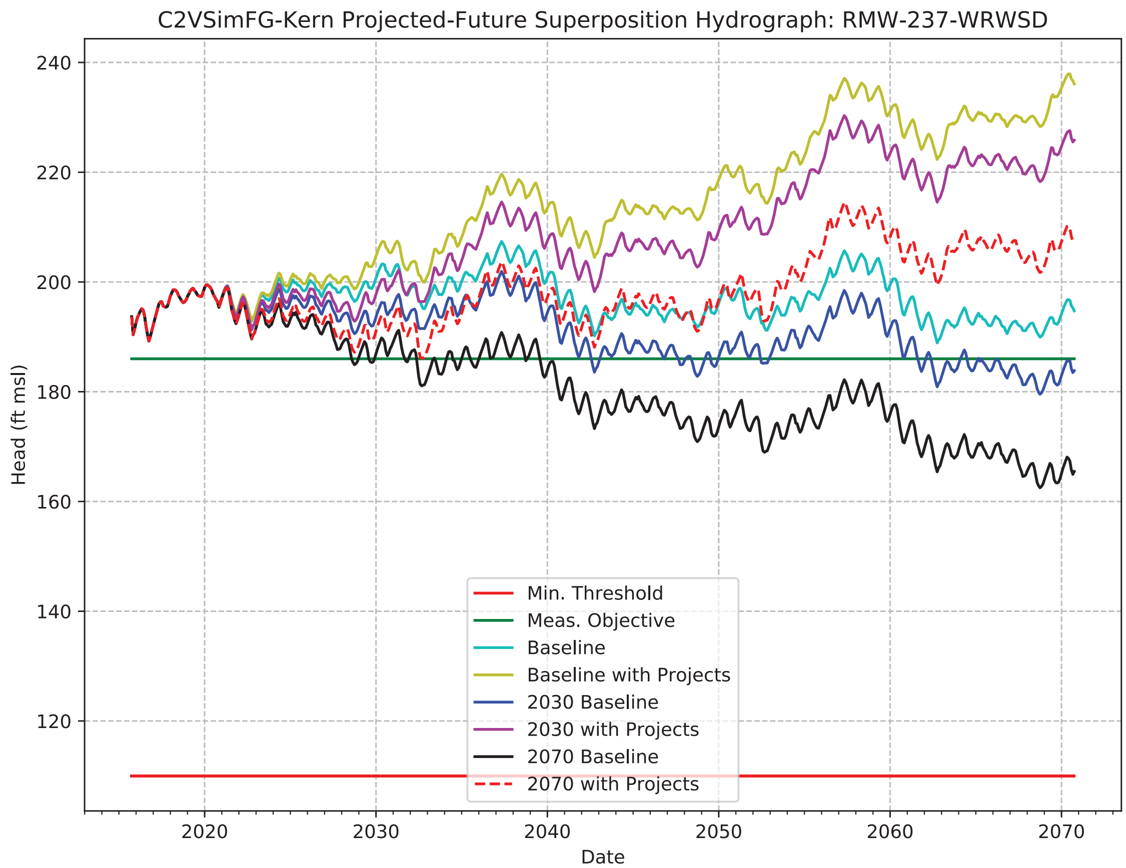
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-233-WRWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date

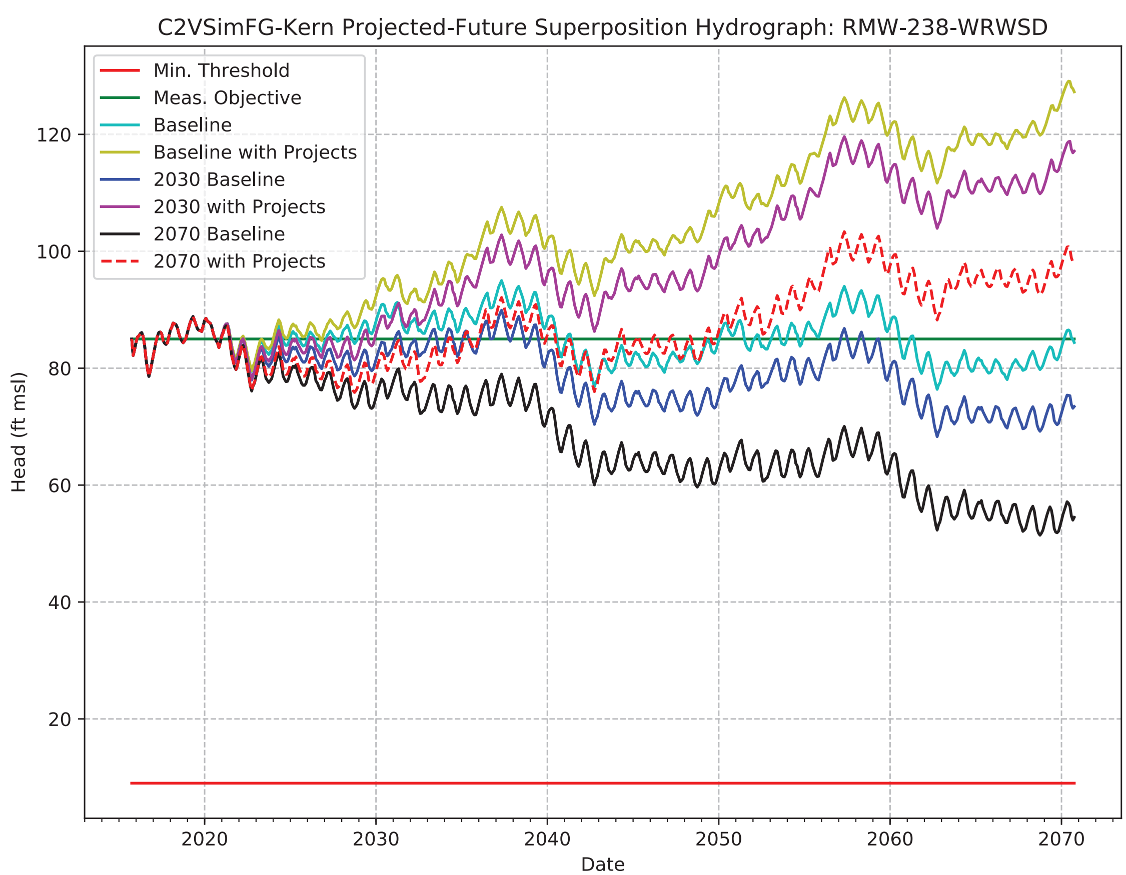



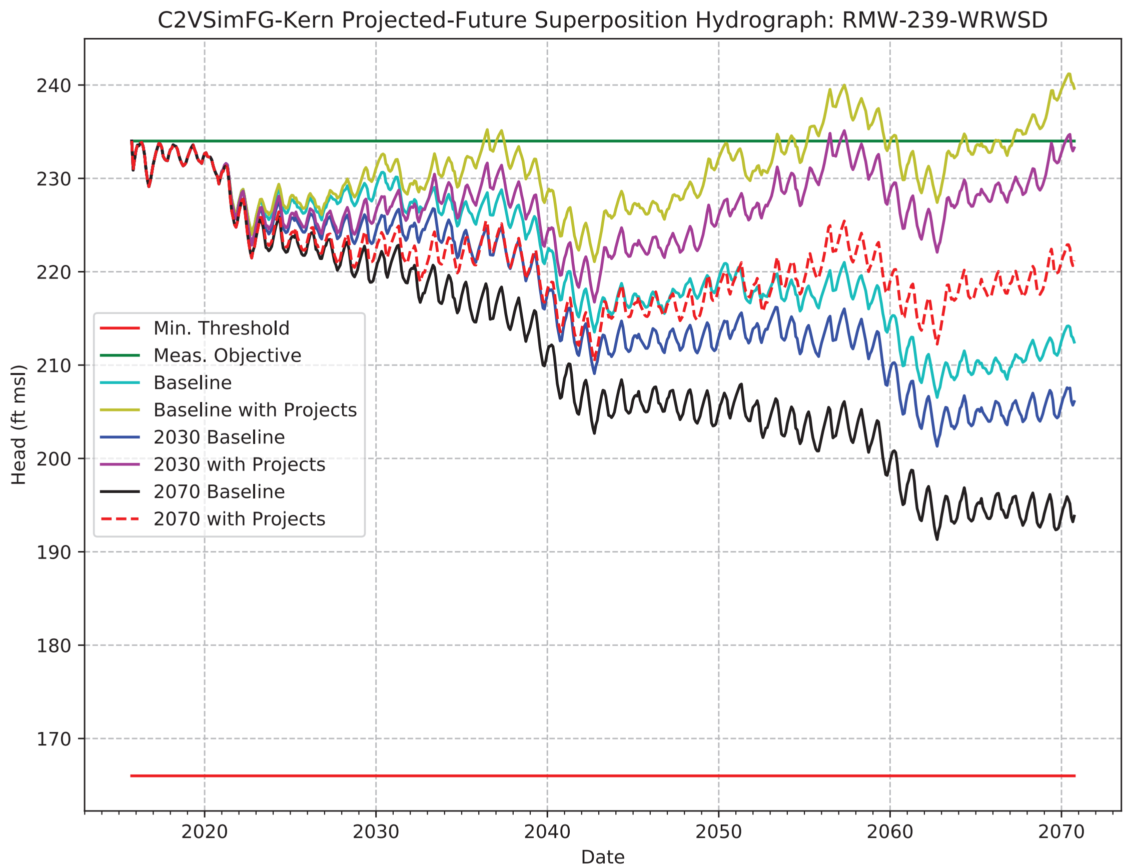
C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-234-WRWSD
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects
Head (ft msl)
Date

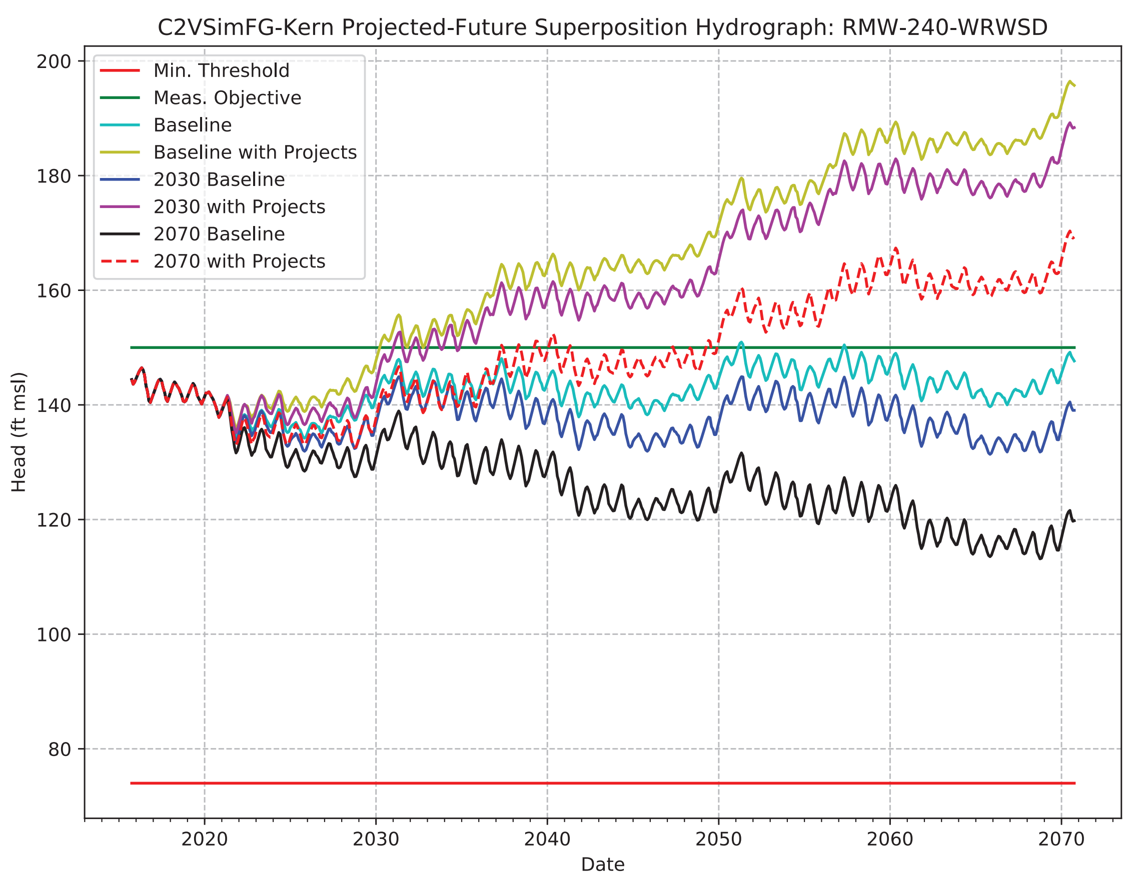

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-235-WRWSD
Head (ft msl)
120
100
80
60
40
20
0
−20
−40
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

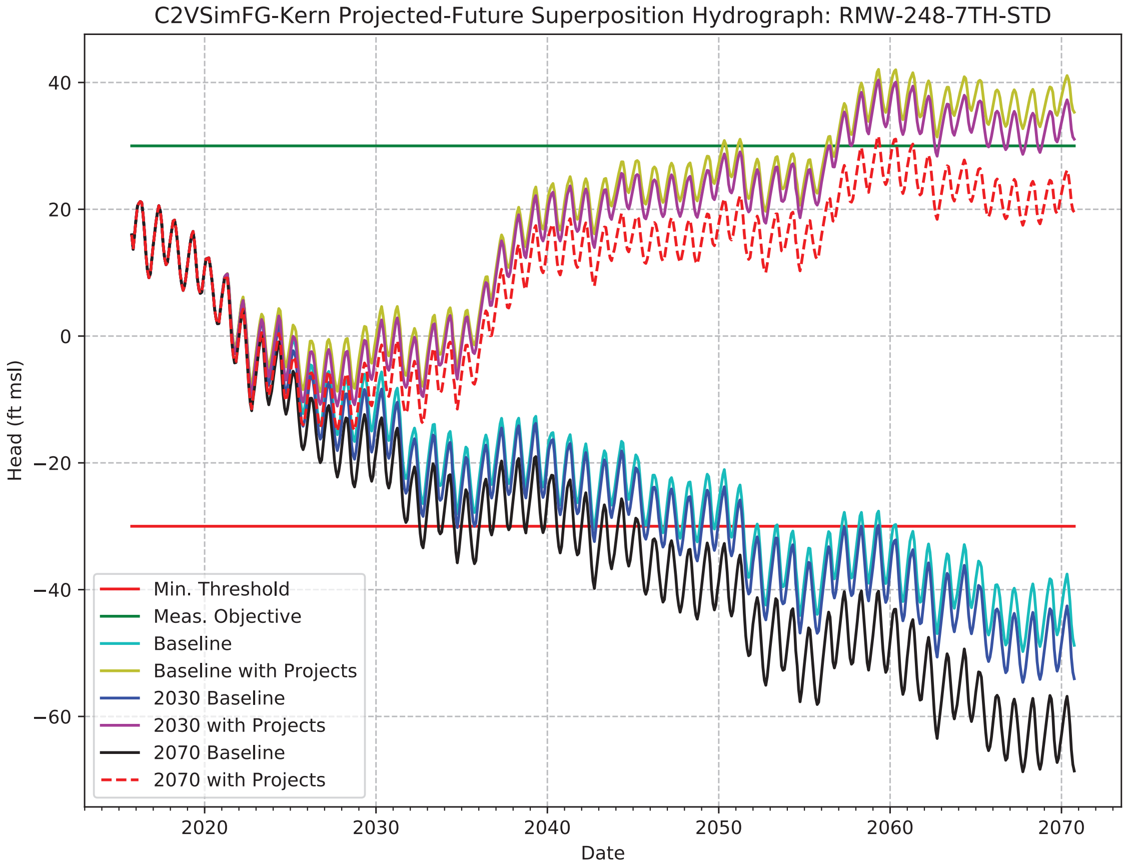

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-236-WRWSD
Head (ft msl)
60
40
20
0
−20
−40
2020
2030
2040
2050
2060
2070
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects

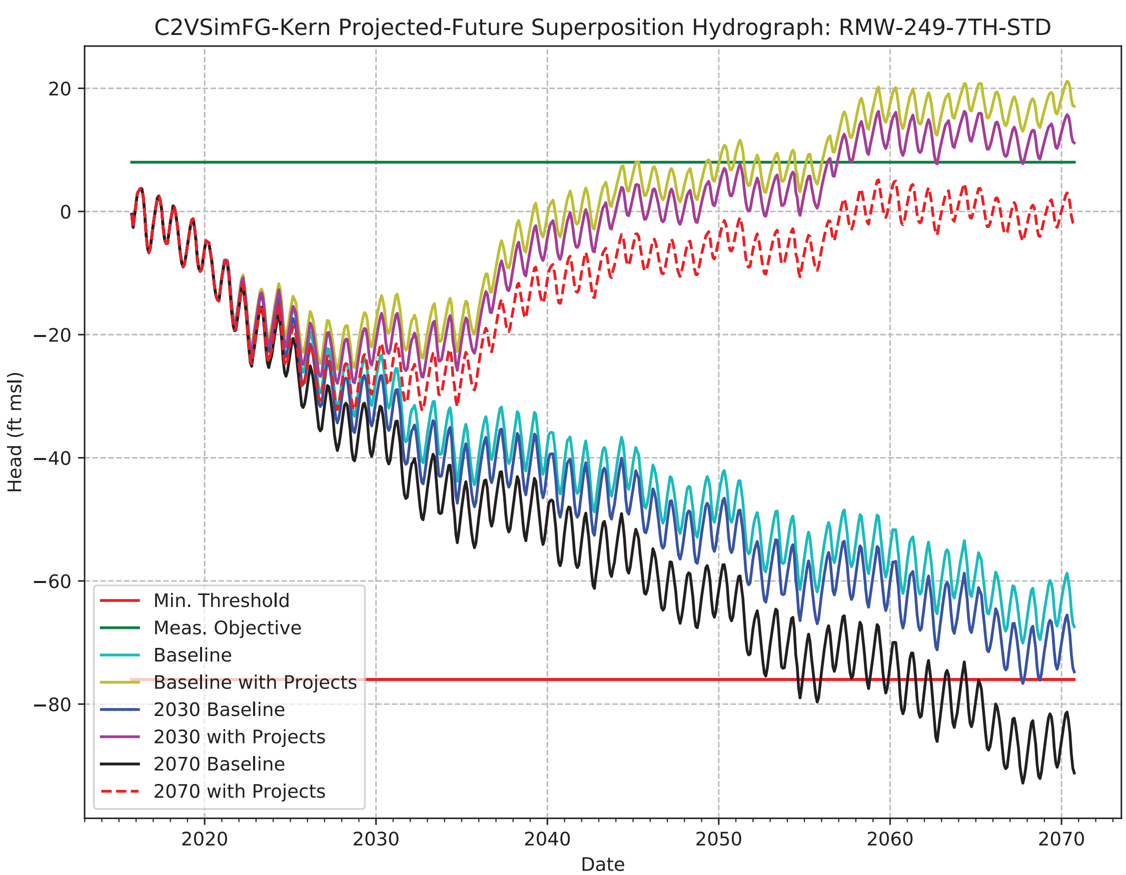

C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-237-WRWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-238-WRWSD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-239-WRWSD
Head (ft msl)
Date
240
230
220
210
200
190
180
170
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-240-WRWSD
Head (ft msl)
Date
200
180
160
140
120
100
80
2020
2030
2040
2050
2060
2070
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-248-7TH-STD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects


C2VSimFG-Kern Projected-Future Superposition Hydrograph: RMW-249-7TH-STD
Head (ft msl)
Date
Min. Threshold
Meas. Objective
Baseline
Baseline with Projects
2030 Baseline
2030 with Projects
2070 Baseline
2070 with Projects