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| **Docket Number:** | 06-AFC-07C |
| **Project Title:** | Humboldt Bay Generating Station - Compliance |
| **TN #:** | 219972 |
| **Document Title:** | Petition to Amend Data Request Response |
| **Description:** | Air Quality |
| **Filer:** | Mineka Foggie |
| **Organization:** | California Energy Commission |
| **Submitter Role:** | Commission Staff |
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**HBGS Air Quality Petition to Amend Data Request Response**

**Although PG&E has requested a change in the diesel pilot heat input from 0.8 MMBtu/hr to 2.0 MMBtu/hr for operational flexibility, PG&E expects to continue operation at or near 0.8 MMBtu/hr for the pilot heat input. It is in PG&E's best financial interests to use as little diesel fuel as possible to operate the engines because natural gas is much less expensive than diesel fuel. The overall permitted heat input of 148.9 MMBtu/hr (as a combination of natural gas and diesel fuel) remains unchanged. On an annual basis, PG&E expects a decrease in the annual average diesel use, as outlined below. Also, the new Title V permit reduces the hourly limit of PM10 in diesel mode from 10.8 pounds per hour to 5.5 pounds per hour. This is the only emissions limit that has changed in the new permit; all other previous emissions limits remain unchanged. Based on these facts, PG&E expects net annual emissions to either remain unchanged or to decrease.**

1. *Please provide additional information on why the diesel consumption rate needs to be increased, specifically:*
   a. *Describe how and when it was discovered that the original diesel pilot fuel limit (up to 0.8 MMBtu/hr) was causing "trips to diesel" (PTA p. 1-2), identify the frequency/number/causes of these trips, and discuss whether there may be other causes of "dependability" problems.*

      **Units S-1 through S-10 came online in late 2010. In early to mid-2015, PG&E operational staff, via routine observation and recordkeeping, identified that the engines were tripping from natural gas to diesel mode more frequently than in previous years. Between January 2015 and February 2017, the engines have tripped on an average of 57 trips per unit, with each trip lasting an average of 3.3 minutes per trip. When PG&E first noticed the increase in trips to diesel mode, PG&E contacted the engine manufacturer (Wartsila) to evaluate the reason the engines were tripping to diesel mode. Wartsila's analyses indicated that the most common instance of increased trips to diesel was when low exhaust gas temperatures were detected in the cylinders of the engines (herein referred to as temperature deviation). The engines, due to their age, were unable to sustain continued operation in natural gas mode in instances when the temperature deviated such that additional heat was required from the diesel pilot. If the diesel pilot was not restricted to a 0.8 MMBtu/hr permit limit, PG&E would be able to use the incremental increase in heat from the pilot to prevent the engine from switching from natural gas mode to diesel mode. PG&E has since continued to engage Wartsila in discussions to determine other causes of dependability problems, including but not limited to, low pilot fuel input.**

   b. *Please describe how the requested diesel pilot fuel limit of 2.0 MMBtu/hr was identified, whether this limit embodies a safety margin over the anticipated actual pilot fuel rate, and explain whether a diesel pilot fuel limit at some level less than a 250 percent increase from the original limit of 0.8 MMBtu/hr would not be sufficient to address the problems stated in PTA Section 1.5.*

      **Based on Warstila's recommendations and actual pilot fuel rate consumptions, the 2.0 MMBtu/hr pilot fuel limit was arrived at by accounting for appropriate safety margins. This value would provide for the adequate pilot heat to avoid unplanned trips to diesel. If the diesel pilot heat input reaches the 2.0 MMBtu/hr trigger level, the unit would be shut down and PG&E would evaluate what was causing the anomaly. Note that this set-point does not definitively correlate with higher hourly pilot diesel consumption during normal operations. PG&E expects to continue operation at or near 0.8 MMBtu/hr for the pilot heat input; it is in PG&E's best financial interests to use as little diesel fuel as possible**

**because natural gas is much less expensive than diesel fuel. While the change from 0.8 MMBtu/hr to 2.0 MMBtu/hr is an increase of 250 percent within itself, the overall permitted heat input to the engines is not changing and the total contribution of heat input from diesel is only changing by 0.8% when the engine is operating in natural gas mode.[1,2] Note that the total heat input for the engines (as a combination of natural gas and diesel fuel) remains unchanged at a value of 148.9 MMBtu/hr.**

c. *Please describe whether the engine manufacturer reviewed the behavior of the fuel delivery system, engine and emissions controls, or engine performance in light of the issues noted (in PTA Section 1.5), and whether any changes to the fuel delivery system or system controls were proposed by the manufacturer and/or implemented.*

**Wartsila conducted extensive analyses on the engines (including the fuel delivery system, engine and emissions controls) to determine the reason for the trips to diesel mode. Ultimately, Wartsila concluded that the problems can be attributed to temperature deviations within the engine which lead to diesel trips and recommended that a higher pilot heat threshold be set to avoid unplanned tripping to diesel mode.**

d. *Please identify whether the diesel flow meters could be replaced with more sensitive meters to correct the "noise" issue noted (in PTA Section 1.5) while operating within the original diesel pilot fuel rate limits.*

**PG&E has discussed the "noise" issue with the flow meter manufacturer and PG&E does not believe that an alternative meter will solve this problem. PG&E calibrates the flow meters annually, per manufacturer's recommendations, to assure the most accurate readings possible.**

2. *Please summarize the historic annual quantities of diesel and natural gas fuel use, separated for all years in operation for each of the ten prime engines (S-1 through S-10), and separated in terms of each engine, as follows:*

a. *Total annual diesel use (gallons/year).*

**Table 2a below includes the total annual diesel usage from 2011 through 2016 for each engine.**

**Table 2a: Total Annual Diesel Use (gallons/year)**

| Unit | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total per unit |
|---|---|---|---|---|---|---|---|
| S-1 | 66,428 | 20,117 | 43,311 | 29,414 | 22,788 | 13,653 | **195,712** |
| S-2 | 36,412 | 21,348 | 36,266 | 26,290 | 8,467 | 6,708 | **135,491** |
| S-3 | 60,654 | 50,241 | 8,998 | 33,823 | 25,852 | 5,863 | **185,431** |
| S-4 | 9,517 | 26,241 | 5,438 | 4,878 | 19,185 | 6,645 | **71,904** |
| S-5 | 7,871 | 5,634 | 24,619 | 4,021 | 9,512 | 12,737 | **64,394** |
| S-6 | 7,005 | 5,357 | 23,878 | 8,740 | 10,559 | 16,629 | **72,168** |
| S-7 | 27,326 | 7,083 | 14,232 | 19,620 | 11,812 | 10,713 | **90,785** |
| S-8 | 30,809 | 60,261 | 25,486 | 13,279 | 16,296 | 6,651 | **152,782** |
| S-9 | 19,955 | 31,346 | 36,474 | 10,908 | 19,429 | 14,693 | **132,805** |
| S-10 | 75,843 | 23,355 | 30,739 | 26,531 | 13,179 | 9,629 | **179,275** |
| **Total per year** | **341,819** | **250,981** | **249,442** | **177,503** | **157,079** | **103,920** | |
| **Previous Title V Permit Annual Diesel Fuel Limit, S-1 through S-10 Combined*** | | | | | | | **1,464,364** |
| ***Amended Petition to maintain previous Title V limits** | | | | | | | |

[1] Percent Difference of Heat Input From Diesel (%) = (2.0 MMBtu/hr / 148.9 MMBtu/hr * 100) - (0.80 MMBtu/hr / 148.9 MMBtu/hr * 100) = 0.8%

[2] Title V Permit NCU 059-12, Condition 69, Table 1 indicates each engine has a heat input of 148.9 MMBtu/hr.

*b. Portion of total annual diesel fuel used during source testing events while in diesel mode.*

**Table 2b includes the total annual diesel usage for each engine unit during source testing while in diesel mode.**

**Table 2b: Annual Diesel Fuel Use (gallons/year) during Source Testing in Diesel Mode**

| Unit | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total per unit |
|---|---|---|---|---|---|---|---|
| S-1 | 14,121 | -- | 8,780 | 18,934 | -- | -- | **41,835** |
| S-2 | 8,476 | -- | -- | 12,182 | -- | -- | **20,658** |
| S-3 | -- | 13,503 | -- | -- | 11,355 | -- | **24,858** |
| S-4 | -- | 18,143 | -- | -- | 10,064 | -- | **28,207** |
| S-5 | -- | -- | 21,601 | -- | -- | 4,199 | **25,800** |
| S-6 | -- | -- | 20,310 | -- | -- | 6,908 | **27,218** |
| S-7 | 11,421 | -- | 8,560 | 13,702 | -- | -- | **33,683** |
| S-8 | -- | 17,663 | -- | -- | 9,494 | -- | **27,157** |
| S-9 | -- | 12,538 | -- | -- | 9,889 | -- | **22,427** |
| S-10 | 16,613 | -- | -- | 10,461 | -- | -- | **27,074** |
| **Total per year** | **50,630** | **61,846** | **59,252** | **55,279** | **40,803** | **11,107** | |

*c. Portion of total annual diesel used during operation in diesel mode.*

**Table 2c includes the total annual diesel usage for each engine unit during operation while in diesel mode.**

**Table 2c: Total Annual Diesel Usage (gallons/year) during Operation in Diesel Mode (includes diesel mode source testing consumption)**

| Unit | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total per unit |
|---|---|---|---|---|---|---|---|
| S-1 | 40,100 | 2,702 | 24,134 | 14,105 | 612 | 409 | **82,061** |
| S-2 | 24,089 | 6,665 | 23,443 | 14,562 | 186 | 396 | **69,340** |
| S-3 | 46,377 | 38,731 | 268 | 19,711 | 11,676 | 291 | **117,054** |
| S-4 | 4,359 | 20,768 | 1,752 | 0 | 10,260 | 561 | **37,699** |
| S-5 | 3,610 | 1,583 | 21,619 | 12 | 317 | 4,262 | **31,401** |
| S-6 | 961 | 1,727 | 20,444 | 3,768 | 235 | 7,269 | **34,403** |
| S-7 | 21,080 | 2,149 | 10,440 | 13,702 | 129 | 337 | **47,837** |
| S-8 | 14,229 | 47,084 | 12,017 | 113 | 9,884 | 248 | **83,573** |
| S-9 | 9,625 | 17,988 | 24,204 | 591 | 10,864 | 586 | **63,858** |
| S-10 | 50,218 | 4,895 | 16,222 | 10,983 | 492 | 906 | **83,716** |
| **Total per year** | **214,649** | **144,292** | **154,542** | **77,545** | **44,653** | **15,263** | |
| **Previous Title V Permit Annual Diesel Mode Fuel Limit S-1 through S-10 Combined*** | | | | | | | **1,087,630** |
| ***Amended Petition to maintain previous Title V limits** | | | | | | | |

*d. Portion of total annual diesel used for pilot fuel while in natural gas mode.*

**Table 2d includes the total annual diesel usage for each engine unit for pilot fuel while in natural gas mode.**

**Table 2d: Total Annual Diesel Usage (gallons/year) for Pilot Fuel during Operation in Natural Gas Mode**

| Unit | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total per unit |
|---|---|---|---|---|---|---|---|
| S-1 | 26,329 | 17,415 | 19,177 | 15,310 | 22,177 | 13,244 | **113,651** |
| S-2 | 12,322 | 14,684 | 12,823 | 11,728 | 8,282 | 6,312 | **66,150** |
| S-3 | 14,278 | 11,510 | 8,730 | 14,112 | 14,175 | 5,573 | **68,377** |
| S-4 | 5,158 | 5,472 | 3,686 | 4,878 | 8,925 | 6,085 | **34,205** |
| S-5 | 4,261 | 4,052 | 3,000 | 4,009 | 9,195 | 8,476 | **32,992** |
| S-6 | 6,044 | 3,631 | 3,435 | 4,972 | 10,323 | 9,360 | **37,764** |
| S-7 | 6,245 | 4,933 | 3,792 | 5,919 | 11,683 | 10,375 | **42,948** |
| S-8 | 16,580 | 13,178 | 13,470 | 13,166 | 6,413 | 6,403 | **69,209** |
| S-9 | 10,330 | 13,357 | 12,270 | 10,317 | 8,565 | 14,107 | **68,946** |
| S-10 | 25,624 | 18,459 | 14,518 | 15,548 | 12,687 | 8,723 | **95,559** |
| **Total per year** | **127,171** | **106,689** | **94,900** | **99,958** | **112,426** | **88,657** | |
| **Previous Title V Permit Annual Diesel Pilot Fuel Limit, S-1 through S-10 Combined*** | | | | | | | **376,734** |
| ***Amended Petition to maintain previous Title V limits** | | | | | | | |

*e. Total annual number of hours of operation in diesel mode due to natural gas supplies being curtailed, in each year since commercial operations began for that engine (hours/year).*

**Table 2e (i) and 2e (ii) include the annual diesel fuel usage and annual hours of operation in diesel mode due to natural gas curtailment from 2011 to 2013. Please note, beginning 2014, units S-1 through S-10 have not operated in diesel mode as a result of natural gas curtailment.**

**Table 2e (i): Annual Diesel Usage (gallons/year) in Diesel Mode due to Natural Gas Curtailment**

| Unit | 2011 | 2012 | 2013 | Total per unit |
|---|---|---|---|---|
| S-1 | 14,933 | 0 | 14,715 | **29,648** |
| S-2 | 134 | 1,377 | 23,113 | **24,624** |
| S-3 | 24,928 | 20,396 | 374 | **45,697** |
| S-4 | 3,890 | 830 | 0 | **4,720** |
| S-5 | 3,186 | 0 | 0 | **3,186** |
| S-6 | 858 | 0 | 0 | **858** |
| S-7 | 2,273 | 0 | 0 | **2,273** |
| S-8 | 14,071 | 21,713 | 12,113 | **47,897** |
| S-9 | 9,603 | 0 | 23,723 | **33,326** |
| S-10 | 24,976 | 0 | 16,365 | **41,340** |
| **Total per year** | **98,851** | **44,316** | **90,402** | |

**Table 2e (ii): Annual Hours of Operation (hours/year) in Diesel Mode due to Natural Gas Curtailment**

| Unit | 2011 | 2012 | 2013 | Total per unit |
|---|---|---|---|---|
| S-1 | 18.0 | 0.0 | 16.5 | **34.5** |
| S-2 | 0.2 | 1.7 | 26.3 | **28.2** |
| S-3 | 27.2 | 21.4 | 0.5 | **49.1** |
| S-4 | 4.8 | 1.0 | 0.0 | **5.7** |
| S-5 | 3.7 | 0.0 | 0.0 | **3.7** |
| S-6 | 1.1 | 0.0 | 0.0 | **1.1** |
| S-7 | 2.9 | 0.0 | 0.0 | **2.9** |
| S-8 | 15.4 | 23.7 | 13.6 | **52.7** |
| S-9 | 27.9 | 0.0 | 26.8 | **54.7** |
| S-10 | 29.0 | 0.0 | 16.3 | **45.3** |
| **Total per year** | **130.0** | **47.7** | **100.0** | |

*f. Total annual diesel fuel used due to unplanned trips from natural gas mode into diesel mode (gallons/year) and number of hours of operation in diesel mode (hours/year) caused by the current limitation on pilot fuel heat rate.*

**Tables 2f (i) and 2f (ii) include the annual diesel fuel usage and hours of operation in diesel mode due to unplanned trips from natural gas mode since 2015. As mentioned in PG&E's response to item #1 above, PG&E began noticing the unplanned trips to diesel mode in 2015.**

**Table 2f (i): Annual Diesel Usage (gallons/year) in Diesel Gas Mode due to Unplanned Trips**

| Unit | 2015 | 2016 | Total per unit |
|---|---|---|---|
| S-1 | 1,337 | 803 | **2,140** |
| S-2 | 444 | 680 | **1,124** |
| S-3 | 510 | 603 | **1,113** |
| S-4 | 915 | 825 | **1,739** |
| S-5 | 935 | 345 | **1,280** |
| S-6 | 792 | 532 | **1,323** |
| S-7 | 215 | 653 | **868** |
| S-8 | 888 | 278 | **1,166** |
| S-9 | 1,790 | 1,191 | **2,980** |
| S-10 | 1,175 | 1,087 | **2,263** |
| **Total per year** | **9,000** | **6,996** | |

**Table 2f (ii): Annual Hours of Operation (hours/year) in Diesel Mode due to Unplanned Trips**

| Unit | 2015 | 2016 | Total per unit |
|---|---|---|---|
| S-1 | 2.0 | 1.0 | **3.0** |
| S-2 | 0.9 | 1.1 | **2.0** |
| S-3 | 1.3 | 1.2 | **2.5** |
| S-4 | 2.2 | 1.7 | **3.9** |
| S-5 | 1.5 | 0.7 | **2.1** |
| S-6 | 1.2 | 1.0 | **2.3** |
| S-7 | 0.6 | 2.1 | **2.7** |
| S-8 | 2.0 | 0.5 | **2.5** |
| S-9 | 3.4 | 2.4 | **5.9** |
| S-10 | 3.3 | 1.4 | **4.7** |
| **Total per year** | **18.4** | **13.1** | |

*g. Total annual number of hours of operation in diesel mode for source testing events (hours/year).*

**Tables 2g (i) and 2g (ii) include the annual diesel fuel usage and annual hours in diesel mode for source testing from 2011 to 2016. Not all engines were source tested in diesel mode each year.**

**Table 2g (i): Annual Diesel Usage (gallons/year) in Diesel Mode for Source Testing**

| Unit | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total per unit |
|---|---|---|---|---|---|---|---|
| S-1 | 14,121 | -- | 8,780 | 18,934 | -- | -- | **41,835** |
| S-2 | 8,476 | -- | -- | 12,182 | -- | -- | **20,658** |
| S-3 | -- | 13,503 | -- | -- | 11,355 | -- | **24,858** |
| S-4 | -- | 18,143 | -- | -- | 10,064 | -- | **28,207** |
| S-5 | -- | -- | 21,601 | -- | -- | 4,199 | **25,800** |
| S-6 | -- | -- | 20,310 | -- | -- | 6,908 | **27,218** |
| S-7 | 11,421 | -- | 8,560 | 13,702 | -- | -- | **33,683** |
| S-8 | -- | 17,663 | -- | -- | 9,494 | -- | **27,157** |
| S-9 | -- | 12,538 | -- | -- | 9,889 | -- | **22,427** |
| S-10 | 16,613 | -- | -- | 10,461 | -- | -- | **27,074** |
| **Total per year** | **50,630** | **61,846** | **59,252** | **55,279** | **40,803** | **11,107** | |

**Table 2g (ii): Annual Hours of Operation (hours/year) in Diesel Mode for Source Testing**

| Unit | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total per unit |
|---|---|---|---|---|---|---|---|
| S-1 | 19 | -- | 11 | 31 | -- | -- | 61 |
| S-2 | 13 | -- | -- | 19 | -- | -- | 32 |
| S-3 | -- | 22 | -- | -- | 20 | -- | 42 |
| S-4 | -- | 29 | -- | -- | 18 | -- | 47 |
| S-5 | -- | -- | 30 | -- | -- | 9 | 39 |
| S-6 | -- | -- | 29 | -- | -- | 11 | 40 |
| S-7 | 18 | -- | 11 | 21 | -- | -- | 50 |
| S-8 | -- | 27 | -- | -- | 18 | -- | 45 |
| S-9 | -- | 21 | -- | -- | 17 | -- | 38 |
| S-10 | 25 | -- | -- | 16 | -- | -- | 41 |
| **Total per year** | 75 | 99 | 81 | 87 | 73 | 20 | |

*h. Total annual number of hours of operation in natural gas mode (hours/year)*

**Table 2h includes the annual hours of operation in natural gas mode for each engine from 2011 to 2016.**

**Table 2h: Annual Hours of Operation (hours/year) in Natural Gas Mode**

| Unit | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total per unit |
|---|---|---|---|---|---|---|---|
| S-1 | 6,386 | 4,325 | 4,563 | 3,154 | 4,514 | 2,939 | **25,881** |
| S-2 | 2,496 | 3,405 | 2,680 | 2,563 | 1,714 | 1,482 | **14,339** |
| S-3 | 3,466 | 3,039 | 1,985 | 3,049 | 3,045 | 1,316 | **15,901** |
| S-4 | 1,276 | 1,291 | 860 | 1,033 | 1,962 | 1,548 | **7,969** |
| S-5 | 882 | 806 | 618 | 933 | 3,011 | 2,312 | **8,562** |
| S-6 | 1,460 | 878 | 830 | 1,069 | 2,462 | 2,525 | **9,224** |
| S-7 | 1,353 | 1,016 | 807 | 1,279 | 2,883 | 2,926 | **10,264** |
| S-8 | 4,460 | 3,836 | 3,863 | 3,035 | 1,370 | 1,569 | **18,133** |
| S-9 | 2,487 | 3,312 | 3,084 | 2,530 | 2,588 | 4,038 | **18,040** |
| S-10 | 5,278 | 3,594 | 2,961 | 3,811 | 2,882 | 2,539 | **21,065** |
| **Total per year** | **29,545** | **25,502** | **22,251** | **22,456** | **26,430** | **23,193** | |

*i. Total annual natural gas use (MMBtu/year or scf/year).*

**Table 2i includes the annual natural gas use for each engine from 2011 to 2016.**

**Table 2i: Annual Natural Gas Usage (MMscf/year) by Unit**

| Unit | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total per unit |
|---|---|---|---|---|---|---|---|
| S-1 | 840 | 572 | 584 | 408 | 560 | 399 | **3,363** |
| S-2 | 320 | 471 | 338 | 314 | 207 | 202 | **1,851** |
| S-3 | 465 | 406 | 277 | 398 | 397 | 186 | **2,130** |
| S-4 | 189 | 199 | 130 | 146 | 263 | 225 | **1,152** |
| S-5 | 127 | 126 | 90 | 131 | 391 | 306 | **1,171** |
| S-6 | 206 | 133 | 119 | 154 | 327 | 345 | **1,284** |
| S-7 | 195 | 152 | 115 | 166 | 356 | 374 | **1,357** |
| S-8 | 576 | 512 | 488 | 402 | 194 | 212 | **2,385** |
| S-9 | 342 | 459 | 405 | 325 | 338 | 514 | **2,384** |
| S-10 | 686 | 476 | 391 | 486 | 378 | 341 | **2,759** |
| **Total per year** | **3,947** | **3,507** | **2,939** | **2,932** | **3,412** | **3,102** | |

3. *Please estimate the changes in actual annual diesel fuel use that the Project Owner expects to achieve if the amendment request is approved, including the proposal to reduce the frequency of diesel mode source testing. Please specify the changes with the following information:*
   *a. Anticipated future (with the proposed amendment or estimated typical-year): diesel mode operation (hours/year) and diesel fuel use (gallons/year).*

   **PG&E only operates the engines in diesel mode during natural gas curtailment events, when the engine switches to unplanned diesel mode during unexpected temperature deviations, and during source testing events.**

   **PG&E expects to operate the engines in planned diesel mode during natural gas curtailment events consistent with how the engines have been operated historically.**

   **PG&E's request to increase the permit limit for the diesel pilot heat input is not related to the number of hours per year the engines will operate in diesel mode. After the diesel pilot heat input permit limit is increased, PG&E does not expect to operate the engines in diesel mode more frequently or consume more diesel fuel while operating in diesel mode. In fact, if PG&E is able to reduce the number of times the engines unexpectedly trip to diesel mode from natural gas mode, PG&E would expect an incremental reduction in unanticipated diesel consumption. To that end, PG&E would accept a condition of certification that would administratively cap diesel consumption provided that such a cap would not affect emergency operations. If Staff is amenable to such a condition, PG&E suggests a workshop conference call to discuss the main components of such a condition.**

   **Additionally, PG&E expects the reduction in frequency of source testing in diesel mode for units S-1 through S-10 (from every three years to every 15 years) to drastically reduce the amount of diesel used per year. 2016 was the first year PG&E implemented the reduced frequency of diesel mode source testing. As shown in Table 2a (total annual diesel use) and Table 2 (g)(i)-(ii), the diesel consumption (gallons/year) and hours of operation (hours/year) for 2016 were significantly lower than prior years. PG&E**

**anticipates annual diesel use in the future years to be comparable to 2016 levels. Outlined below are historical values for diesel usage for 2011 through 2016.**

**Operation in diesel mode: Between 2011 and 2015, units S-1 through S-10 on average ran for 163 hours/year and used 127,136 gallons/year of diesel. Comparatively, in 2016, units S-1 through S-10 ran for a total of 32 hours/year and used a total of 15,263 gallons/year of diesel.**

**Operation in natural gas mode: Pilot fuel diesel consumption during operation in natural gas mode is expected to remain comparable to historic levels. Between 2011 and 2016, units S-1 through S-10 on average used 104,967 gallons/year.**

**Note that HBGS has cumulatively used under 1,300,000 gallons of diesel over the course of 6+ years since the facility's commissioning. This value is significantly lower than CEC's initial estimated level of 1,500,000 gallons per year and projected level of 2,000,000 gallons per year for the proposed amendment. Total yearly diesel fuel consumptions are listed in Table 2a, and summarized here.**

**Total Annual Diesel Use (gallons/year)**

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total |
|---|---|---|---|---|---|---|---|
| **Total per year** | 341,819 | 250,981 | 249,442 | 177,503 | 157,079 | 103,920 | **1,280,744** |
| **Previous Title V Permit Annual Diesel Fuel Limit, S-1 through S-10 Combined*** | | | | | | | 1,464,364 |
| ***Amended Petition to maintain previous Title V limits** | | | | | | | |

*b. Anticipated future (with the proposed amendment or estimated typical-year): diesel mode hours of operation for source testing events (hours/year) and diesel fuel use during source testing events (gallons/year).*

**As identified in the HBGS Title V Operating Permit Number NCU 059-12, dated February 17, 2016, the frequency of source testing in diesel mode for units S-1 through S-10 has been reduced from every three years to every 15 years. Using the most recent three year period when diesel mode source tests were conducted at a higher frequency (i.e., 2013-2015), the ten units (across various loads) used a combined total of 155,333 gallons of diesel and operated 241 hours across three years. This equates to annual average values of 51,778 gallons/year of diesel and 80 hours/year during source testing in diesel mode. PG&E expects that each future source test in diesel mode will use a comparable amount of diesel fuel and last a similar amount of time regardless of changes to the pilot fuel heat input. A reduced frequency of source tests will result in decreased annual average diesel fuel use and overall time spent source testing. Averaged over 15 years, diesel source testing is expected to consume approximately 10,356 gallons/year of diesel and take 16 hours/year. This is consistent with the 2016 diesel mode stack testing values presented in Tables 2 g(i)-(ii).**

*c. Anticipated future (with the proposed amendment or estimated typical-year): natural gas mode hours of operation (hours/year) and diesel pilot fuel use (gallons/year).*

**PG&E anticipates that the increase to the permitted diesel pilot fuel heat input will slightly increase the hours of operation in natural gas mode due to fewer trips to diesel mode. While the diesel pilot fuel use may be slightly higher on a short-term basis (as a result of the 2.0 MMBtu/hr set-point), the annual average diesel pilot fuel use is**

**anticipated to remain at a level comparable to historical values due to the reduction in unanticipated trips from natural gas mode to diesel mode. PG&E does not intend to re-tune the engines to operate up to the proposed higher pilot heat level of 2.0 MMBtu/hr. As noted in response to item #1 above, PG&E expects to continue operation at or near 0.8 MMBtu/hr for the pilot heat input. On average, between 2011 and 2016, units S-1 through S-10 ran in natural gas mode for 24,896 hours/year and used 104,967 gallons/year of diesel pilot fuel. PG&E anticipates future annual hours of operation in natural gas mode and diesel pilot fuel use to be comparable to these numbers. It is in PG&E's best financial interests to use as little diesel fuel as possible to operate the engines because natural gas is much less expensive than diesel fuel.**

4. *Please summarize the current or most recent 12-month diesel fuel use for each of the emergency diesel engines, the emergency generator engine (S-11) and fire pump engine (S-12), including periods of source testing.*

   **A total of 116.4 gallons and 376.3 gallons were used by S-11 and S-12 respectively during the 12-month period from January 1, 2016 to December 31, 2016. Note that these units were not source tested during this time.**

5. *Please describe how diesel fuel is presently being delivered to the site and whether the proposed changes in limitations on diesel use could result in an increase in tanker truck traffic for diesel fuel deliveries.*

   **Diesel fuel is delivered to HBGS from a local vendor in 5,000 gallon tank trucks. As required by Condition 128 of HBGS' Title V Operating Permit Number NCU 059-12 (issued in 2016), PG&E maintains required documentation of the diesel specifications, higher heating value and sulfur content for each bulk delivery of diesel fuel. As noted in item #3 above, reduced source testing in diesel mode will likely result in a downward trend for diesel fuel deliveries as a result of the proposed amendment.**

6. *Please provide the following static physical parameters for the facility's main engines (S-1 through S-10) and for the emergency generator engine (S-11) and fire pump engine (S-12), all denoted as S-1 through S-12; and buildings with as much accuracy as possible:*
   a. *Stack location in UTM coordinates (meters)*
   b. *Stack height (meters)*
   c. *Stack diameter (meters)*
   d. *Building and structure dimensions (meters), for modeling downwash*

   **PG&E most recently conducted an HRA in February 2011 for HBGS which was submitted to the CEC. The information presented in the 2011 HRA is representative of current operations (i.e., stack parameters as well as building information have remained unchanged).**

7. *Please provide the following dynamic physical parameters based on full load operation for the facility's main engines (S-1 through S-10), in diesel mode and in natural gas mode, and for the emergency generator engine (S-11) and fire pump engine (S-12) with as much accuracy as possible:*
   a. *Exhaust volumetric flow (cubic meters per second)*
   b. *Exhaust velocity (meters per second)*
   c. *Exhaust temperature (degrees kelvin)*

   **PG&E most recently conducted an HRA in February 2011 for HBGS which was submitted to the CEC. The information presented in the 2011 HRA is representative of current operations (i.e., stack parameters as well as building information have remained**

**unchanged). PG&E does not believe additional HRA is warranted especially since PG&E is willing to accept a condition of certification limiting diesel consumption as discussed in Response to Data Request 3 above.**

8. *Please provide a tabulated summary of all of the source tests completed to date, subsequent to the emissions compliance tests report for nine engines (prepared by Avogadro Group, dated November 11, 2010). Identify the source tests that have occurred on the facility's main engines (S-1 through S-10), the emergency generator engine (S-11), fire pump engine (S-12). The tabulated summary should contain the following information:*

   a. *Date of test*
   b. *Engine name (S-1 to S-12)*
   c. *Exhaust volumetric flow (cubic meters per second)*
   d. *Exhaust velocity (meters per second)*
   e. *Exhaust temperature (degrees kelvin)*
   f. *Natural Gas usage rate during source tests (MMBtu/hr or scf/hr)*
   g. *Diesel usage rates during source tests, including:*
      i. *Pilot diesel use, for S-1 to S-10 (gal/hr)*
      ii. *Total diesel use (gal/hr)*
   h. *Total particulate matter (PM10) emissions rate (lb/hr)*
   i. *Toxic Air Contaminant (TAC) emissions rates (lb/hr) for each TAC tested, including diesel particulate matter (DPM).*
   j. *Nitrogen oxides (NOx) emissions rate (lb/hr)*
   k. *Natural gas heat content (Btu/scf)*
   l. *Diesel fuel heat content (Btu/gallon or Btu/lb)*
   m. *Identify whether engine trips have occurred during the source tests, and if so, please provide a description of the circumstances and the emissions recorded during the event.*

   **Please see the attached tabulated summary of all source tests completed as of the date of this response, subsequent to the November 11, 2010 source test prepared by Avogadro Group. Please note the emergency generator (S-11) and the emergency fire pump engine (S-12) have not been source tested as it is not required by the Title V permit.**

9. *Please investigate and describe any change in populations that have occurred since September 2008 within 6 miles of the HBGS, including sensitive receptors (schools, day care facilities, hospitals, nursing homes, etc.) and Environmental Justice communities. Please provide the results of this investigation with appropriate tables and maps.*

   **According to the State of California Department of Finance, the population estimate for Eureka, CA was 26,845 in 2008 and 26,765 in 2016. [3] This data suggests a slight decrease in population of 0.3% over eight years. Changes in sensitive receptors have remained relatively low, with the biggest change being a slight increase in child care facilities. Changes to sensitive receptors and environmental justice communities within a six mile radius of HBGS are discussed further in detail in the sections below.**

   ***9.1 Schools***

   **According to a review of the California Department of Education's active school database, between 2008 and 2016 four schools were closed, two schools were opened, and 22 schools remained active within a six mile radius of HBGS.[4] Table 9a below lists the schools which**

[3] State of California Department of Finance. Accessed March 2, 2017. Available here: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/

[4] California Department of Education, California School Directory. Accessed March 2, 2017. Available here: http://www.cde.ca.gov/re/sd/index.asp

**were active in the years 2008 and 2016. Figure 9a maps the schools which were active in 2008 and Figure 9b maps the schools which were active in 2016. In each figure, the black pin indicates the location of HBGS, the yellow pins represent each school listed in Table 9a, and the red circle represents a radius of six miles surrounding HBGS.**

**Table 9a: Active Schools within Six Miles of HBGS in 2008 and 2016**

| 2008 | 2016 |
|---|---|
| Academy of the Redwoods | Academy of the Redwoods |
| Alder Grove Charter School | Alder Grove Charter School |
| Alice Birney Elementary School | Alice Birney Elementary School |
| Cutten Elementary | Cutten Elementary School |
| Eureka Community School | Eureka Community School |
| Eureka High School | Eureka High School |
| Eureka Secondary Community Day School (closed 2008) | Glen Paul School |
| Glen Paul School | Gospel Outreach School |
| Gospel Outreach School | Grant Elementary School |
| Grant Elementary School | Humboldt County Office of Education Court |
| Humboldt Bay High School (closed 2011) | Humboldt County ROP |
| Humboldt County Office of Education Court | Koinonia Academy |
| Humboldt County ROP | Lafayette Elementary School |
| Koinonia Academy | Pacific View Charter School |
| Lafayette Elementary School | Pine Hill Elementary School |
| Lincoln Elementary School (closed 2008) | Redwood Christian School |
| Pacific View Charter School | Ridgewood Elementary School |
| Pine Hill Elementary School | South Bay Elementary School (opened 2011) |
| Redwood Christian School | St. Bernard High School |
| Ridgewood Elementary School | St. Bernard's Academy |
| St. Bernard High School | Washington Elementary School |
| St. Bernard's Academy | Winship Middle School (opened 2013) |
| Trinity Christian Academy (closed 2011) | Zane Middle School |
| Washington Elementary School | Zoe Barnum High School |
| Zane Middle School | -- |
| Zoe Barnum High School | -- |

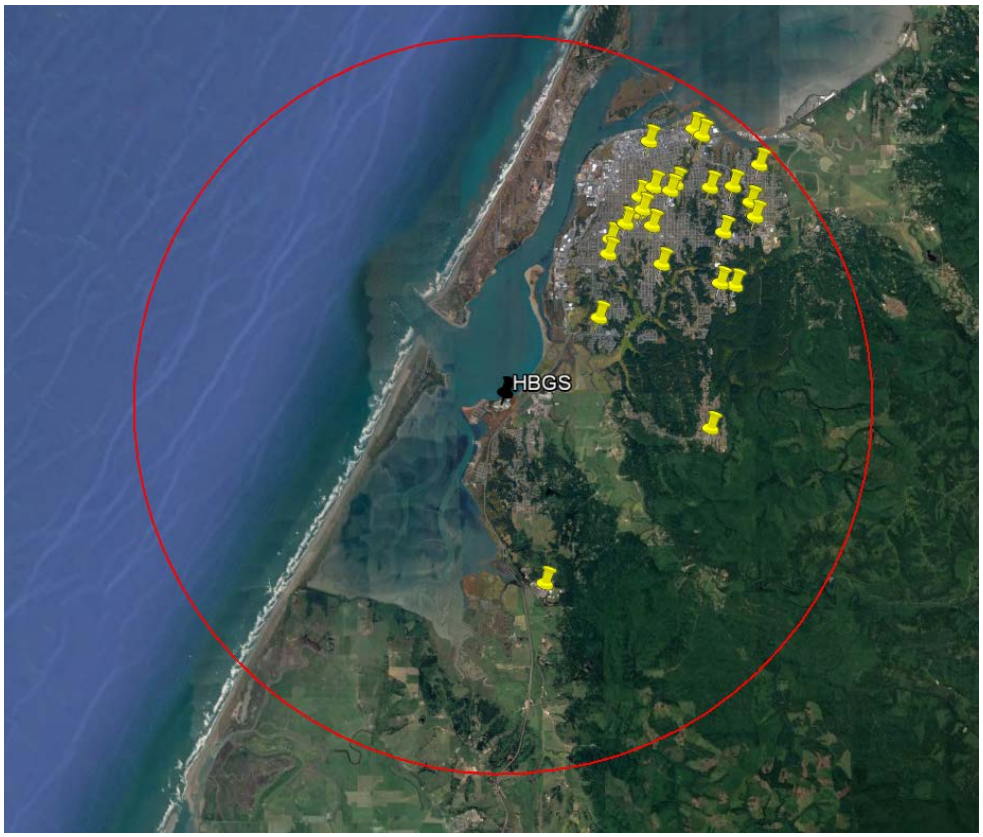


**Figure 9a: Active Schools in 2008**

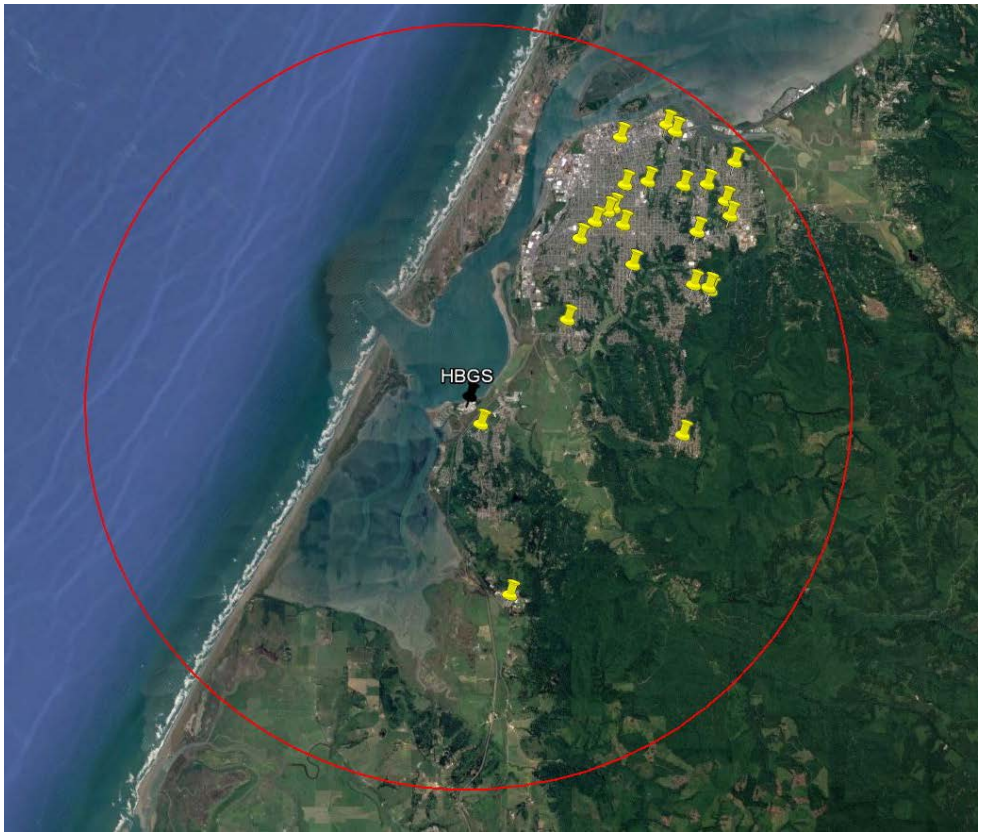


**Figure 9b: Active Schools in 2016**

### *9.2 Child Care Facilities*

**According to a review of the California Department of Social Services licensed Child Care-Infant Centers (ages 0-2) and Child Care Center Preschools (ages 2-5) and an online review, there were 12 child care facilities in operation in 2008 located within six miles of HBGS, and 18 child care facilities in operation in 2016 within a six mile radius of HBGS.[5] The child care facilities in operation in 2008 and 2016 are listed in Table 9b below. Maps of the child care facilities in operation in 2008 and 2016 are provided in Figure 9c and Figure 9d respectively. In each figure, the black pin indicates HBGS, the green pins represent each child care facility listed in Table 9b, and the red circle represents a radius of six miles surrounding HBGS.**

**Table 9b: Child Care Facilities within Six Miles of HBGS in 2008 and 2016**

| 2008 | 2016 |
|---|---|
| College of the Redwood Child Center | Children's Cottage Infant Center (opened 2013) |
| Head Start - Alice Birney | College of the Redwood Child Center |
| Head Start – Jefferson | Head Start - Alice Birney |
| Head Start – Worthington | Head Start - Jefferson |
| Indian Action Council Child Dev. Center | Head Start - Worthington |
| Lil Tikes | Jefferson Early Head Start (opened 2015) |
| Little Angels Preschool and Daycare | Kids Unlimited Child Care Center (opened 2014) |
| Little People's Corner | Lafayette Preschool (opened 2014) |
| Play and Learn Preschool | Little Learners Eureka Infant and Toddler (opened 2015) |
| St. Bernard's Preschool | Little People's Corner |
| Teachers Pet Daycare | Play and Learn Preschool |
| Winzler Children's Center | Sonoma Street Head Start (opened 2010) |
| -- | St. Bernard's Preschool |
| -- | Sweet Pea Learning Center |
| -- | Teachers Pet Daycare |
| -- | Wind in the Willows (opened 2010) |
| -- | Winzler Children's Center |
| -- | Yorok Tribe Early Childhood Education Center (opened 2012) |

[5] California Department of Social Services. Accessed March 2, 2017. Available here: https://secure.dss.ca.gov/CareFacilitySearch/home/index

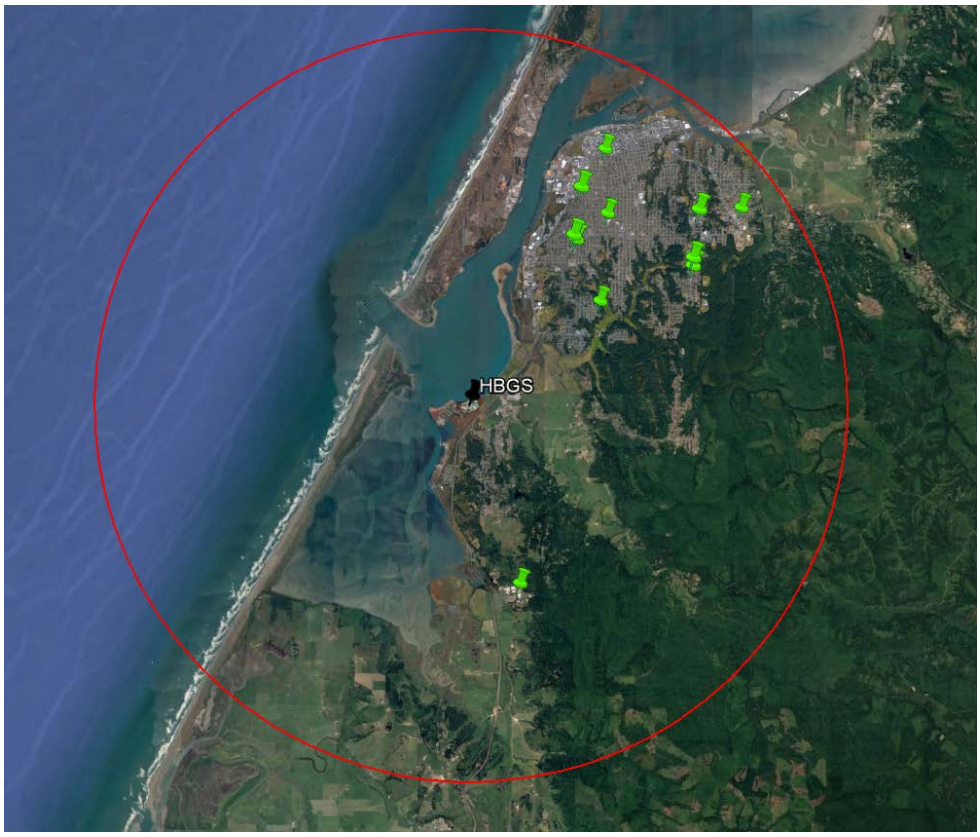


**Figure 9c: Child Care Facilities in Operation in 2008**

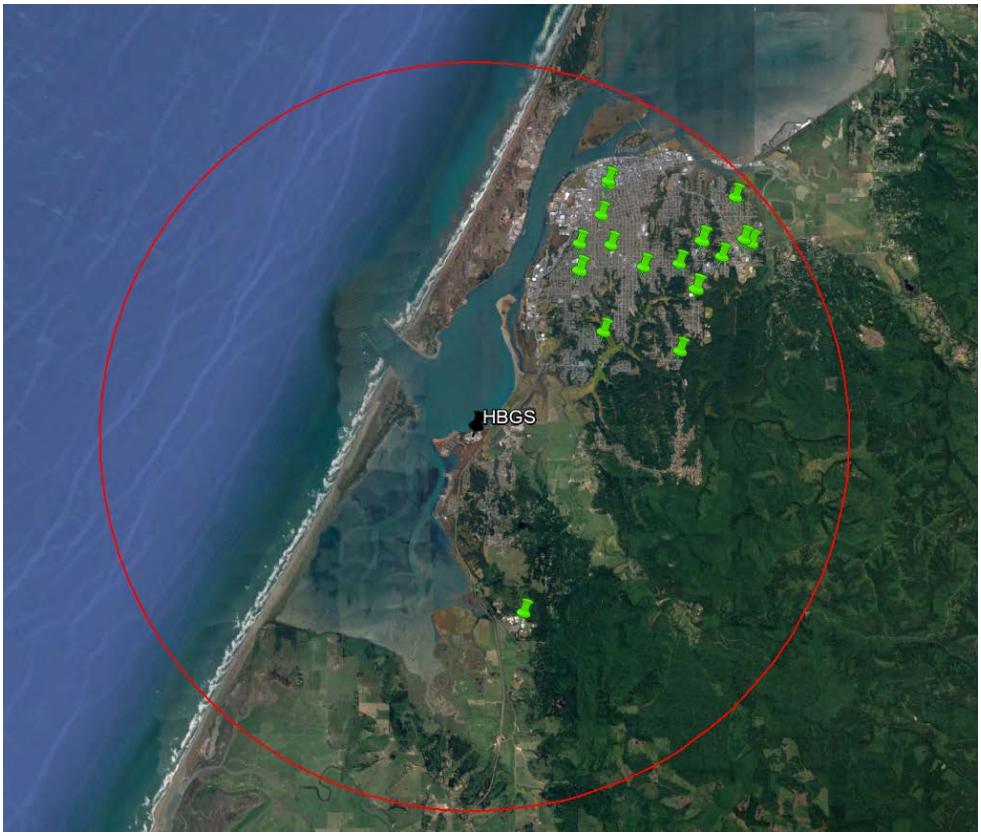


**Figure 9d: Child Care Facilities in Operation in 2016**

### *9.3 Hospitals*

**According to the Partnership Health Plan of California Medi-Cal Provider Directory for Humboldt County and an online review, there are three major hospital centers located within six miles of HBGS that were active in 2008 and 2016.[6] These facilities are listed in Table 9c and mapped in Figure 9e. In the figure, the black pin indicates HBGS, the red pins represent each major hospital facility listed in Table 9c, and the red circle represents a radius of six miles surrounding HBGS.**

**Table 9c: Major Hospital Facilities within Six Miles of HBGS in 2008 and 2016**

| 2008 | 2016 |
|---|---|
| St. Joseph Hospital | St. Joseph Hospital |
| General Hospital | General Hospital |
| Sempervirens Psychiatric Care Facility | Sempervirens Psychiatric Care Facility |


**Figure 9e: Major Hospital Facilities in 2008 and 2016**

[6] Partnership Health Plan of California Medi-Cal Provider Directory for Humboldt County. Accessed March 2, 2017. Available here: http://www.partnershiphp.org/Providers/Medi-Cal/Documents/Provider%20Directory/MCHumboldtProDir.pdf

### *9.4 Nursing Homes*

**According to the Partnership Health Plan of California Medi-Cal Provider Directory for Humboldt County, and an online review, there are seven major nursing home facilities located within six miles of HBGS that were active in 2008 and 2016.[7] These facilities are listed in Table 9d and mapped in Figure 9f. In the figure, the black pin labeled "HBGS" is the location of HBGS, the orange pins represent each major nursing home facility listed in Table 9d, and the red circle represents a radius of six miles surrounding HBGS.**

**Table 9d: Major Nursing Home Facilities within Six Miles of HBGS in 2008 and 2016**

| 2008 | 2016 |
|---|---|
| Eureka Rehabilitation & Wellness Center | Eureka Rehabilitation & Wellness Center |
| Pacific Healthcare & Rehabilitation Center | Granada Rehabilitation & Wellness Center |
| Granada Rehabilitation & Wellness Center | Pacific Healthcare & Rehabilitation Center |
| Seaview Rehabilitation & Wellness Center | Seaview Rehabilitation & Wellness Center |
| Alder Bay Assisted Living Center | Alder Bay Assisted Living Center |
| Timber Ridge at Eureka | Timber Ridge at Eureka |
| Crestwood Manor | Crestwood Manor |

[7] Partnership Health Plan of California Medi-Cal Provider Directory for Humboldt County. Accessed March 2, 2017. Available here: http://www.partnershiphp.org/Providers/Medi-Cal/Documents/Provider%20Directory/MCHumboldtProDir.pdf

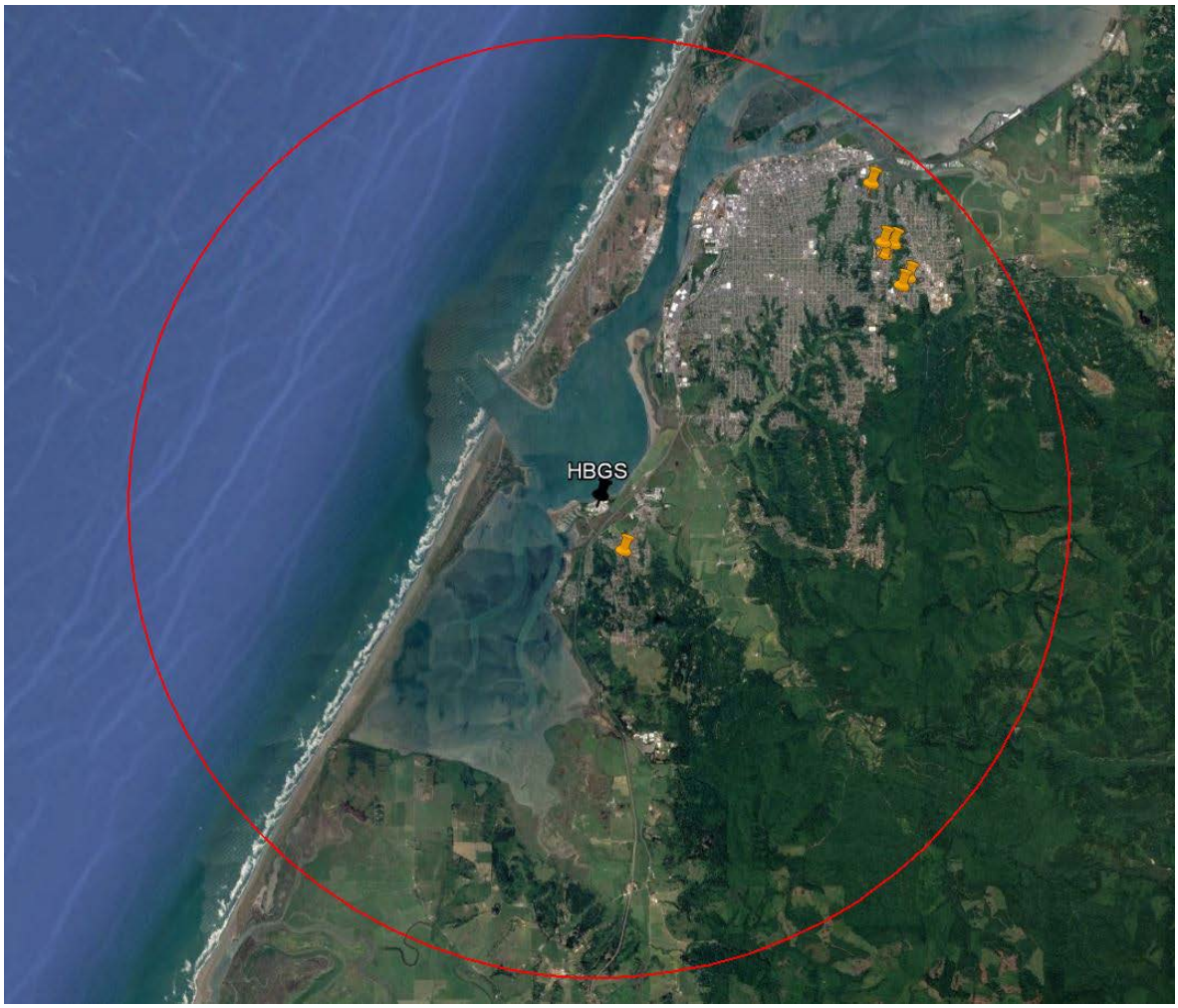


**Figure 9f: Major Nursing Home Facilities in 2008 and 2016**

### *9.5 Environmental Justice Communities*

**Environmental justice communities were identified using the CalEnviroScreen 3.0 tool created by the Office of Environmental Hazard Assessment (OEHHA) on behalf of the California Environmental Protection Agency (CalEPA).[8] The CalEnviroScreen 3.0 tool scores and maps populations based on their exposure to environmental impacts and their population characteristics such as socioeconomic status and ethnic profile. Higher scores indicate increased risk due to environmental impacts, lower socioeconomic status, and traditionally disadvantaged ethnic groups. The maximum score of 100% represents the communities at highest risk for environmental injustice and the lowest score of 1% represents the communities at lowest risk for environmental injustice. As seen in Figure 9g below, the populations within a six mile radius surrounding HBGS range in scores from 1% to 60%. In the figure the black pin indicates HBGS and the red circle represents a radius of six miles surrounding HBGS.**

**Environmental justice data is often based on socioeconomic and ethnic data collected by the US Census Bureau every ten years. The CalEnviroScreen 3.0 tool utilizes the most recent 2010 US Census Bureau data. As there is no known credible source of socioeconomic status data or ethnic population data collected for Eureka, CA specifically in 2008 and 2016, it is assumed that the 2010 data is representative of both 2008 and 2016. The total population in Eureka, CA remained relatively steady between 2008 and 2016, and as such it is assumed that the environmental justice communities remained relatively steady as well.**

[8] CalEnvironScreen 3.0 report and tool download available here: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30

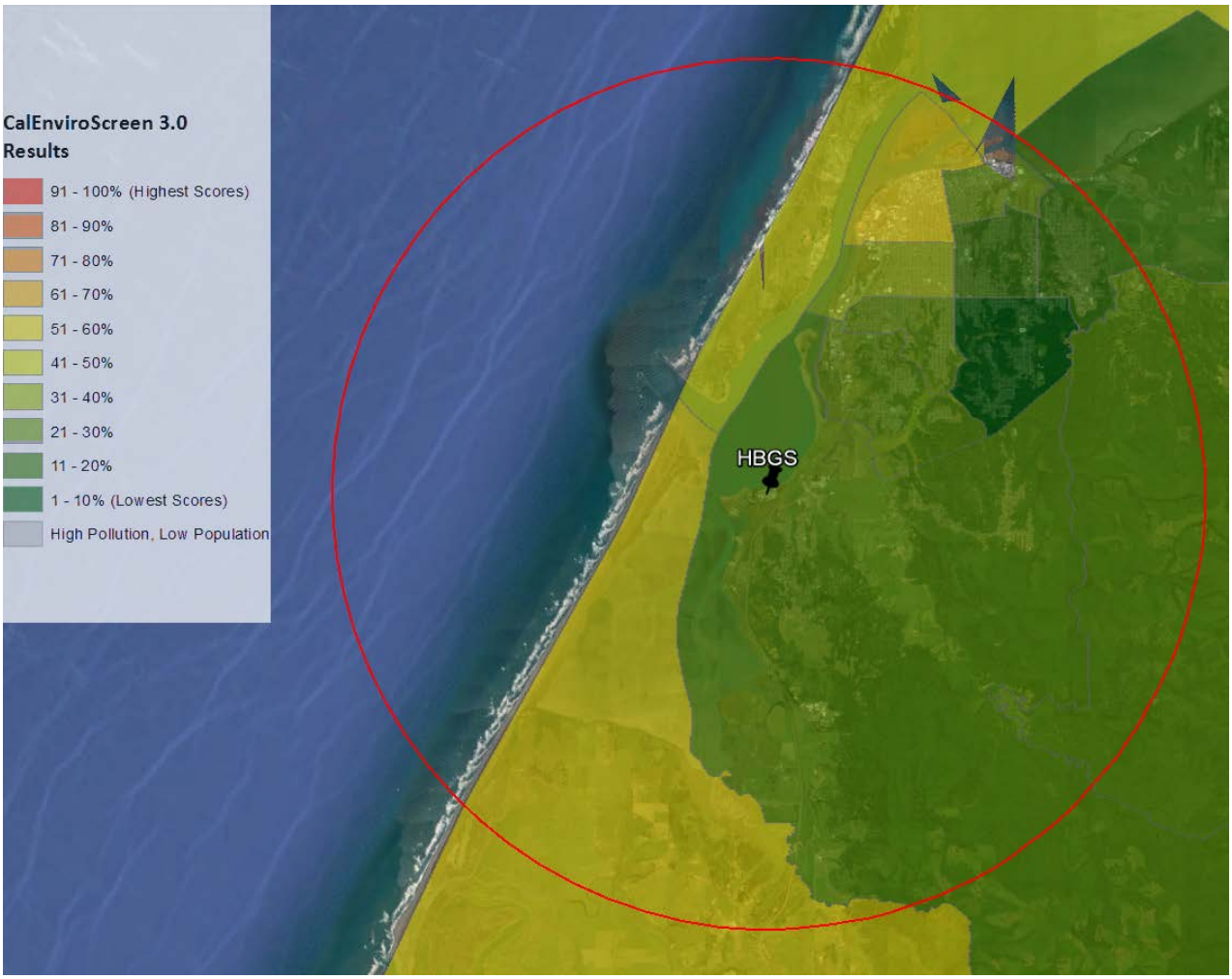


**Figure 9g: Environmental Justice Community Map**

10. *Please provide (i.e., file to the HBGS Docket) copies of correspondence with all local, State and federal air quality agencies related to the proposed amendment and the District's February 2016 Title V Permit to Operate and April 2016 PTO.*

    **All correspondence with local, State, and federal air quality agencies related to the proposed amendment and the District's February 2016 Title V Permit and April 2016 revised Permit has been provided by PG&E to Jonathan Fong and Bruce Boyer at the California Energy Commission.**

11. *Please continue to provide any subsequent/additional correspondence with all local, State and federal air quality agencies related to the proposed amendment within 5 days of its submittal or receipt.*

    **As available, PG&E will continue to provide any correspondence with air quality agencies to the CEC within 5 days of submittal or receipt.**

12. *Please provide a protocol for conducting air dispersion modeling to support a new HRA and submit the modeling protocol to the CPM for review and approval. This protocol should describe all air dispersion model input parameters in tabular format for easy review. The protocol should also include a justification for all TAC emission factors used as inputs to the HRA, including the diesel*

*mode DPM emissions factor, and all natural gas mode TAC emissions factors, including the diesel pilot DPM emissions factor.*

**Please refer to the response for Item 14 below.**

13. *Please provide a protocol for preparing a new and revised HRA and submit the HRA protocol to the CPM for review and approval. The new and revised HRA would use the following:*
    a. *The current OEHHA HRA methodology (2015).*
    b. *The current population data, gathered in support of Data Request #9, above.*
    c. *The source test results for those TACs measured in the 2010 source tests plus data from the California Air Toxics Emission Factor (CATEF) database for those TACs not measured in the source tests.*
    d. *The anticipated future operational profile (with the proposed amendment or estimated typical-year) for the power plant in the following modes: natural gas mode; diesel mode; and source testing events.*
    e. *Source test results for other diesel emissions from the emergency generator and testing of the emergency fire pump engines.*

    **Please refer to the response for Item 14 below.**

14. *Please provide the completed air dispersion modeling analysis following the approved protocol and a completed HRA following the approved protocol.*

**PG&E most recently conducted an HRA in February 2011 for HBGS which was submitted to the CEC. The modeling input parameters used in the February 2011 HRA are consistent with HBGS' current operations. As noted above in response to item #1, while PG&E requested a change in the diesel pilot heat input from 0.8 MMBtu/hr to 2.0 MMBtu/hr for operational flexibility, PG&E expects to continue operation at or near 0.8 MMBtu/hr for the pilot heat input. PG&E also asserts that it is in PG&E's best financial interests to use as little diesel fuel as possible to operate the engines because natural gas is much less expensive than diesel fuel. The overall permitted heat input of 148.9 MMBtu/hr (as a combination of natural gas and diesel fuel) remains unchanged. On an annual basis and as outlined in response to item #3 above, a decrease in the annual average diesel use is expected. Also, as stated in the response to item #9 above, the population changes within six miles of the HBGS are relatively small between 2008 and 2016, indicating that the February 2011 HRA is likely representative of the current population profile surrounding HBGS. Therefore, PG&E believes that the public health impacts represented in the 2011 HRA adequately reflect current and future operations at HBGS and an updated HRA is not required due to the proposed amendment and as described in Response to Data Request 3, is willing to accept a condition of certification to limit diesel consumption.**