CALIFORNIA PUBLIC UTILITIES COMMISSION
Safety and Enforcement Division
Gas Safety and Reliability Branch
Gas Engineering and Compliance Section

Report on Staff Investigation Of Leaks At Stonegate Subdivision

Report Date: May 9, 2014

Investigator: Alin Podoreanu

Utility: Pacific Gas and Electric (PG&E)

Location: Stonegate Subdivision

West Davis, CA

Witnesses:

Name	***Title***	***Phone***
David Johnson	Stonegate Safety Committee	(530) 756-2752
Laurence Deniston	PG&E Regulatory Compliance	(925) 974-4313
Lawrence Berg	PG&E Regulatory Compliance	(925) 974-4084
Steve Lillya	Manager – Stonegate	(530) 756-2285

Evidence:

1. Consumer Letter from David Johnson dated July 17, 2012
2. PG&E's response to data request dated July 20, 2012
3. Stonegate HOA-2007 Accelerated Survey (Logs-1) submitted July 20, 2012
4. Stonegate HOA-2007 Accelerated Survey (Logs-2) submitted July 20, 2012
5. Stonegate HOA-2007 Accelerated Survey (Plats) submitted July 20, 2012
6. Stonegate HOA-2012 Davis Special Survey submitted July 20, 2012
7. Stonegate HOA-5-yr Survey 2007 submitted July 20, 2012
8. Stonegate HOA-5yr Survey 2012 submitted July 20, 2012
9. PG&E's response to data request dated August 13, 2012
10. Stonegate Leak Repair Data submitted August 13, 2012
11. PG&E's response to data request dated November 1, 2012
12. PG&E's response to data request dated December 26, 2012
13. PG&E's response to data request dated February 15, 2013

14. David Johnson's email dated May 15, 2013
15. PG&E's response to data request dated October 8, 2013

Background:

On July 17 2012, the Safety and Enforcement Division (SED) of the California Public Utilities Commission (CPUC) received a written complaint addressed to Commissioner Florio's Office from PG&E customer David Johnson (Stonegate Citizens Safety Committee), concerning 88 gas leaks in PG&E's Stonegate Subdivision in west Davis, California (Stonegate).

In his letter, David Johnson expressed concerns about the public safety of the subdivision due to the susceptibility of Aldyl-A pipe to brittle-like cracking and 88 Aldyl-A related gas leaks that have occurred in Stonegate since 2006. Mr. Johnson stated the following concerns and requests:

Concern #1: Existence of brittle-like cracking and premature failures of Aldyl-A pipe in Stonegate could represent a potential public safety hazard.

SED reviewed PG&E's leak repair data for the Stonegate[1] dating back to 1977. The leak cluster data indicated the breakdown for *Aldyl-A* pipe by leak source and leak cause in Table 1:

Aldyl-A Reported Leak Repair Data								
Leak Source **Leak Cause**	**Plastic Tee Caps**	**Body of Pipe**	**Tap Connections**	**Fusion Joints**	**Mechanical Joints**	**Fittings**	**Risers**	**Total**
Construction Defect	32	1	2					35
Material Failure	1	2	6	1	1	1		12
Other	3	3	1	1			1	9
Excavation		8						8
Plastic Crack Failure	2	2					1	5
Unknown	1			1		1	2	5
Plastic Embrittlement	2							2
Total	41	16	9	3	1	2	4	76

Table 1

SED also reviewed PG&E's electronic A-Forms for leak repairs dating from April 2006 to

[1] PG&E's leak cluster map that was submitted as part of the data request response dated December 26, 2012 identified the Stonegate boundaries used to establish leak clusters.

March 2012. PG&E's A-Forms for Aldyl- A leak repairs in the Stonegate area[2] identified the plastic pipe condition as "under stress/bent" or "cracked" in Table 2:

	Leak #	Grade	Under Stress/Bent	Cracking	Source
1	06-55019-1	1	Y	Y	Fitting
2	10-55044-1	1	Y	Y	Body of Pipe
3	10-90114-1	1	Y	N	Riser
4	10-90245-1	1	Y	N	Fusion Joint
5	11-55060-1	1	Y	Y	Fitting
6	12-55049-1	1	Y	N	Fitting

Table 2

One additional A-Form for a plastic pipe made of PE 2406 material identified the plastic pipe condition as follows:

Leak #	Grade	Under Stress/Bent	Cracking	Source
10-90107-1	1	Y	Y	Body of Pipe

Table 3

Based on historical data, SED believes that construction defects on tee caps and not material failure due to brittle like cracking on body of pipe were the main cause of Aldyl-A plastic leak repairs in Stonegate.

Concern #2: *PG&E's replacement of 2,000 feet of gas distribution line and 28 service lines did not occur at the location of highest concentration of gas leak clusters in Stonegate.*

SED confirmed the replacement of approximately 1890 ft. of PG&E's 2-in Aldyl-A main and 1,825 ft. of Aldyl-A service line in Stonegate. PG&E provided SED with a leak cluster map on December 12, 2012 and indicated that Aldyl-A main was replaced along sections of Magellan Street, Marina Circle and Oyster Bay Avenue.

Based on PG&E's data request response dated November 1, 2012, SED found that PG&E developed leak clusters based on 20 years of leak data history and a threshold of 7 leaks or greater within a 100 ft. radius of each other. SED identified two locations with the highest concentration of leak clusters in its Stonegate Subdivision as follows:

[2] As part of the initial data request, PG&E provided additional leak repair data, outside of the boundaries of Stonegate as defined by PG&E's leak cluster map. SED considered this data in identifying leak repair records, which indicated pipe under stress or cracking. The subdivision as defined by the Stonegate Country Club Homeowners Association includes additional parcels outside the boundaries established by PG&E's leak cluster map.

Table 4: location #1 near Marina Circle (where the 2012 Aldyl-A replacement project took place) and Table 5: location #2 near Lake Terrace Circle. SED identified the following leak repairs at the approximate locations with the high concentration of gas leak clusters based on 20-year data:

Location #1 (2012 Pipeline Replacement)					
FID	**LEAKNO**	**Leak Grade When Found**	**Line Material**	**Construction Year**	**Leak Above Ground?**
4	5093550371	1	PE 2406(Orange)	1977	N
5	5093550471	1	Aldyl A	1978	N
7	5091850091	1	Aldyl A	1977	N
8	5094550101	1	Aldyl A	1979	N
9	5094850001	2	Aldyl A	1979	N/A[3]
10	5095850531	2	PE 2406(Orange)	1977	N
18	5000550041	1	Other	1979	N
26	5003550681	2	Aldyl A	1978	N
40	5005550021	1	Aldyl A	1980	N
42	5005550251	2+	Aldyl A	1979	N
51	5009550631	1	Aldyl A	1977	N
53	5010550331	1	Aldyl A	1978	N
54	5010550981	1	Steel/Wrought Iron	1978	Y
55	5010550991	1	PE 2406(Orange)	1978	N
56	5010551001	1	Aldyl A	1978	N
70	5010902451	1	Aldyl A	1978	N
73	5011353111	1	Aldyl A	1981	N
74	5011353121	1	Aldyl A	1980	N
77	5011353151	3	Steel	1982	Y
82	5011353231	2	Steel	1978	Y
87	5011550251	2+	Aldyl A	1977	N
91	5011550601	1	Aldyl A	1978	N

Table 4

Location #2					
FID	**LEAKNO**	**Leak Grade When Found**	**Line Material**	**Construction Year**	**Leak Above Ground?**
1	5089550301	1	Aldyl A	1980	N
2	5092850011	2	Aldyl A	1979	N
3	5092850031	2	PE 2406(Orange)	1987	N
22	5001550341	2	Aldyl A	1987	N
23	5001550391	2+	Aldyl A	1979	N

[3] SED considered Leak Repair No. 5094850001 (FID #9) as below ground because the leak source recorded was an Aldyl-A plastic tee cap.

24	5001550401	2+	Aldyl A	1979	N
43	5005550321	1	Aldyl A	1988	N
44	5005550331	1	Aldyl A	1985	N
50	5009550161	2+	Aldyl A	1987	N
80	5011353211	3	Steel	1972	Y
83	5011353241	3	Steel	1977	Y
95	5011551021	1	Aldyl A	1985	N
96	5011551031	1	Aldyl A	1981	N
97	5011551041	1	Aldyl A	1981	N
98	5011551051	1	Aldyl A	1985	N
99	5011551061	1	Aldyl A	1983	N
100	5011551071	1	Aldyl A	1985	N
103	5012350221	3	Steel	1979	Y
105	5012350241	2	Steel	1969	N

Table 5

From Tables 4 and 5, SED found that the leak clusters around location #1 consisted of 15 underground Aldyl-A leaks on pipe installed between 1977 and 1981. Leak repair data for location #2 consisted of 14 Aldyl-A underground leaks on pipe installed between 1979 and 1985. Although leak repair records did not indicate the manufacturing date of the pipe involved, SED noted that the majority of Aldyl-A leak repairs were performed on pipes constructed near location #1 than location #2. Also, the construction dates of the repaired pipes near location #1 were generally earlier than location #2.

SED believes that PG&E established a system to obtain the leak data and prioritize all its leak repairs based on a leak cluster methodology. The replacement of Aldyl-A pipe at location #1 (along sections of Magellan Street, Marina Circle and Oyster Bay Avenue) appears to be reasonable. SED finds that this replacement project occurred where PG&E's leak repair records indicated the highest concentration of below ground Aldyl-A leak repairs and the installation of the oldest pipe.

Concern #3: *Answers provided by PG&E implied the company does not know the locations of Aldyl-A gas lines.*

As part of the investigation for the complaint filed by the Stonegate Citizens Safety Committee, SED obtained the following description of the gas pipeline facilities for Stonegate from PG&E:

"The majority of the gas main and services in the Stonegate subdivision are DuPont's Aldyl-A pipe that was installed in 1985 and earlier. Exceptions to this are the steel pipe and services installed in the southern end of the subdivision and small areas of Uponor TR-418, Drisco, and Plexco plastic pipe installed after 1985 when PG&E stopped using Aldyl-A pipe in the Davis area.

The steel pipe is installed in Russell Boulevard at the southern boundary of Stonegate, in Lake Boulevard from Russell Boulevard to a point south of Arlington Boulevard, and at the southern end of the subdivision (Breton Avenue, Jerome Street, Hubble Street, Portsmouth Avenue, Bermuda Avenue, south of Portage Bay Way, Topsail Place, and the southern end of Marina Circle).

The areas with the other brands of plastic pipe are primarily in the northeast corner (western end of Morro Bay Avenue and Seabright Avenue) and northwest corner (Woods Circle, Boathouse Avenue, Estero Bay, Coho Place, Westshore Street, and Del Mar Place) of Stonegate and in the apartments and shopping center on either side of Lake Boulevard south of Arlington Boulevard. PG&E also recently replaced some Aldyl-A pipe on Marina Circle, Chespeake Bay Avenue, Secret Bay Street, and Magellan Street.

Request: *Replace all Aldyl-A plastic gas distribution lines in west Davis, or as an interim measure, replace Aldyl-A lines and plastic "service tee" caps where there are documented clusters of leaks in west Davis.*

SED reviewed the safety requirements set forth in GO 112-E and Title 49 CFR 192, as follows:

Title 49, Code of Federal Regulations (CFR), § 192.723 Distribution systems: Leakage surveys, states in part:

"(a) Each operator of a distribution system shall conduct periodic leakage surveys in accordance with this section.

(b) The type and scope of the leakage control program must be determined by the nature of the operations and the local conditions, but it must meet the following minimum requirements:

(2) A leakage survey with leak detector equipment must be conducted outside business districts as frequently as necessary, but at least once every 5 calendar years at intervals not exceeding 63 months…"

PG&E's Utility Operations (UO) Standard S4110-Attachment 1, effective October 2010, adopts the minimum required frequency specified in *CFR § 192.723* and requires all underground distribution lines, to be leak surveyed once each 5-year interval not to exceed 62 months with the exception of service lines to schools, hospitals, business districts and churches which are to be surveyed annually.

PG&E recorded leak survey results in the Stonegate Subdivision using plats. PG&E records indicated that the subdivision was comprised of the following plats: YOLO-2581-A7, YOLO-2581-A8, YOLO-2581-B7, YOLO-2581-B8, YOLO-2520-J7 and YOLO-2520-J8. A review of the plats since 2006 indicated that the plats were leak

surveyed as part of the 5-year cycle in March 2007 and the 1st quarter of 2012. In addition, records showed that the Stonegate subdivision was leak surveyed in 2010 during accelerated surveys[4] and in December 2011 as part of a special leak survey in Davis.

Based on the documentation reviewed, SED did not find any instances of PG&E violating 49 CFR 192.723.

Title 49, Code of Federal Regulations (CFR), § 192.703 General, states in part:

"(c) Hazardous leaks must be repaired promptly."

SED reviewed PG&E's UO Standard S4110-Attachment 1, which details grading criteria, response action and repair criteria for leaks. PG&E used various criteria to determine if leaks were hazardous or non-hazardous such as proximity to buildings, gas concentration and potential for safety hazards. PG&E categorized leaks as Grade 1, Grade 2+, Grade 2 and Grade 3 with the Grade 1 being the most hazardous type of leak requiring immediate response to repair or mitigate. UO S4110 stated the following action criteria for grade types:

Leak Grade	Action
1	Take immediate and continuous corrective action to eliminate the hazard.
2+	Repair or clear not to exceed 90 days.
2	Repair or clear no later than 18 months.
3	Recheck at next scheduled survey or other interval.

Table 6

SED reviewed leak repair records and did not find any instances of PG&E violating 49 CFR 192.703.

Title 49, Code of Federal Regulations (CFR), § 192.13(c), states:

"…Each operator shall maintain, modify as appropriate, and follow the plans, procedures, and programs that it is required to establish under this part…"

SED reviewed PG&E's 2006 through 2012 leak repair records for the Stonegate Subdivision and noted the following leak repair:

Leak #	Grade	Date Reported	Date Repaired
07-35022-1	2+	March 14, 2007	August 1, 2007

Table 7

[4] PG&E conducted 2007 Accelerated Leak Surveys on distribution facilities system-wide.

PG&E OU Standard S4110, issued October 2005, required repair of Grade 2+ leaks within 90 days. Based on the leak repair records provided by PG&E, SED determined that leak no. 07-35022-1 was repaired outside the 90-day timeframe. Therefore, PG&E was in violation of Title 49 CFR 192.13(c) for not following its written procedure.

SED obtained the following leak repairs per mile rates for Stonegate and PG&E's overall system.

Year	Aldyl-A		All Pipe		Other Plastic Pipe		Stonegate: Aldyl-A		Metallic
	Number of Leak Repairs	Leak Repair Per Mile	Leak Repair	Leak Repair Per Mile	Leak Repair	Leak Repair Per Mile	Leak Repair	Leak Repair Per Mile of main	Leak Repair
2007	904	0.16	4,086	0.10	859	0.06	1	0.2	2,323
2008	1,625	0.29	13,745	0.33	2,336	0.15	1	0.2	9,784
2009	3,598	0.64	52,521	1.25	5,367	0.35	3	0.6	43,556
2010	2,415	0.43	17,439	0.42	2,133	0.14	8	1.5	12,891
2011	1,596	0.28	14,662	0.35	1,770	0.12	16	3.0	11,296
Total	**10,138**		**102,453**		**12,465**		**29**		**79,850**
Mileage	**5,666**		**42,013**		**15,386**		**~5.4**		**20,961**

Table 8

Note: PG&E's accelerated leak survey (ALS) program in 2008-2010 resulted in more leaks found and repaired system-wide.

Based on the data included in its February 15, 2013, response, PG&E indicated 29 leaks on Aldyl-A in Stonegate, excluding excavation damage, over 5-year duration. SED noted that leak rates in subdivisions could be higher compared with the system wide leak repair rates due to the larger number of connections and fittings in subdivisions.

SED reviewed leak repair data and found that the leak source for leak no.11-353-171 was reported as "riser valve threads" although repair documentation identified that the repair was performed on a service tee cap. Therefore, SED concluded that the total number of Aldyl-A leak repairs for 2011 should be 17 leaks.

SED questioned PG&E on its performing continued accelerated leak surveys at Stonegate. In its August 13, 2012 response, PG&E stated:

"PG&E has not implemented an accelerated leak survey of the Stonegate neighborhood distribution system. PG&E temporarily performed additional bi-weekly (every two weeks) leak surveying of the Stonegate neighborhood in Davis beginning on October 31, 2011. These special leak surveys continued through January 2012, when we began a pipeline replacement project in Stonegate and also began our 5-year leak survey in that

area. The additional special leak surveying was to address customer concerns in the area."

Conclusion:

Based on reviews of Title 49 CFR 192 and G.O. 112-E, SED did not find any mandatory requirements for operators that specifically require the replacement of Aldyl-A pipelines or plastic tee caps. SED found historical data to indicate that construction defects on tee caps, and not material failure due to brittle like cracking on body of pipe were the primary cause of Aldyl-A plastic leak repairs at Stonegate.

SED found that PG&E repaired 81 Grade 1, 2+ and 2 leaks, and categorized five Grade 3 leaks. PG&E stated that two out of the five Grade 3 leaks were subsequently deleted when they were not found on a re-check performed prior to repair.

PG&E's Safety Plan filling dated June 28, 2013, states the following:

"PG&E prioritizes all gas pipeline replacement projects based on a risk determination that includes the probability of a leak on each section of pipe and the potential consequences of that leak. Each section of pipe is assigned a priority value corresponding with this probability and consequence of a leak. The company maintains a database of GPRP pipe and updates the priority values at least annually.

PG&E has also initiated the replacement of Aldyl,-A distribution pipe. Certain vintages of Aldyl-A plastic have shown a susceptibility to cracking creating the potential for gas leaks. As a result, PG&E inventoried the gas distribution system to identify the location and vintages of Aldyl-A plastic pipe and initiated a replacement program in 2012. Approximately 26 miles were replaced in 2012 and 50 miles are targeted for 2013. By 2014, PG&E plans to replace approximately 100 miles annually on a going forward basis. In total, PG&E is planning to replace approximately 1,500 miles of the approximately 5,725 miles of Aldyl-A pipe over the next 15 years."

PG&E further explained the methodology behind prioritization of Aldyl-A projects as follows:

"The primary factor in determining if a main is to be replaced is the leak repair data, which indicates the potential of a material issue with the Aldyl-A plastic. Secondary factors include population density, areas of public assembly, pipe vintage, operating pressure and the potential for ground movement. Replacement projects are prioritized in order of the pipe with the greatest risk based on the likelihood of leakage and the associated potential consequence."

Out of approximately 5,600 miles of Aldyl-A main, PG&E has identified approximately 50 miles for replacement in 2013 and 100 miles for replacement in 2014 and 2015. The following is a summary of the Aldyl-A replacement mileage identified for replacement by 2015:

PG&E Division	Planed Miles for Replacement
Central Coast	2.74
De Anza	3.43
Diablo	32.21
East Bay	13.14
Fresno	23.66
Kern	3.40
Mission	10.81
North Bay	10.07
North Coast	8.19
North Valley	13.37
Peninsula	14.82
Sacramento	54.61
San Francisco	2.57
San Jose	15.46
Sierra	6.08
Stockton	14.58
Yosemite	19.30
Grand Total	248.44

Table 9

SED found that PG&E has identified and prioritized Aldyl-A replacement projects across multiple divisions including the replacement project in the Stonegate based on a history indicating material issues with Aldyl-A main. PG&E's response indicated that *"the main replacement project that PG&E executed in 2012 at Stonegate addressed these historical leak indications but the remainder of the Aldyl-A main at Stonegate has not been scheduled for replacement due to the absence of similar leak data."*

SED found that replacement of approximately 2000 feet of gas distribution lines and 28 service lines appeared to be reasonable based on PG&E's leak cluster methodology, including two plastic crack failures on body of pipe, at the location where the replacement project occurred.

Through this investigation, SED found one instance of PG&E violating 49 CFR 192.13 by failing to repair leak no. 07-35022-1 within a 90-day timeframe specified by the company standards.

As of April 2, 2014, GSRB learned from PG&E that PG&E's Aldly-A replacement strategy remains unchanged.