PARSONS ENGINEERING SCIENCE, INC.

MEMORANDUM

November 14, 1995

To: Bob Duchek

From: Rich Maurer

Subject: SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
RESPONSE TO QUESTIONS REGARDING:
(1) PIPELINE BREAKS,
(2) AGRICULTURAL FIELD LAYOUT,
(3) CONSTRUCTION ACTIVITIES FOR PIPELINES

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1. What amount of reclaimed water could be leaked from a pipe suffering a break ?

The amount of water that would leak from a pipe break depends on the size of the break, the pressure of the line at the break, the opportunity to isolate the section of pipeline with the break, and the length of time the leak continues.

Pipelines proposed for the various alternative projects differ in size, from 8" to 60" for Alternative 2 and 3, 42" and 48" for Alternative 4, and 48" and 54" for Alternative 5. Pipeline pressures vary (up to 600 psig near the pump stations of Alternative 4) depending on location along the line.

Isolation valves in the pipelines have been proposed at a spacing of about 10,000 feet for all pipelines installed along public rights-of-way.

The length of time a leak may continue would relate to the time the break went undetected and the time it would take to close an isolation valve. Because nearly all proposed pipelines are along public rights-of-way, it is expected that a major pipeline break would show itself and be detected within several hours of the break. Smaller leaks could go undetected or be confused with natural drainage flows. In either case, several tens of thousands of gallons of reclaimed water could be leaked from such a pipeline break before detection and repair. Therefore, an aggressive program of regular inspection

along the various pipeline alignments is proposed to check for such pipeline breaks.

There is no practical way to automatically detect pipeline breaks along buried pipelines of the size and length proposed in these alternative projects; pressure changes would be the most likely candidate method but, because the pressure at any given point along the pipeline would vary due to normal operation, and because the pressure along the pipeline would vary by location, detection of minute pressure changes as a means of "detecting" a pipeline break would be unreliable. Instrumenting the length of the proposed pipelines (which total many tens of thousands of feet for each alternative project) for the detection of abnormal pressure conditions would be impractical and unreliable.

Visual inspection for detection of pipeline breaks is proposed as the most practical and reliable method. Once detected, the closest isolation valve on either side of the break could be located and closed in about one hour.

The major conditions which could lead to pipeline breaks include seismic activity and landslides, and unusual pressure spikes due to improper system operation. Pressure spikes due to improper operation would be protected against by designing the pipeline to accommodate these spikes. This would include extra pipeline wall thickness and inclusion of pressure surge equipment and controls at the pump stations (where pressure spikes are usually initiated).

As for the geologic conditions of seismic activity and landslides, the project area, as a whole, does not have a high seismic threat. The only proposed pipelines which would cross known fault zones are the urban irrigation mainlines (12" size to the Fountaingrove area and 18" size to the Bennett Valley area) and two locations along the Geysers pipeline (one 42" size and one 48" size).

Potential landslides are a threat for irrigation distribution pipelines in the west county area (up to 60" size) and for the Geysers pipeline along Pine Flat Road (42" size), in particular.

Because of the various possible combinations of the many factors identified above it is difficult to pick a "typical" pipeline break scenario.

2. What are the components in a typical agricultural field layout ?

For the purposes of design and the cost estimate, it was assumed that the "typical" agricultural irrigation field layout in the west county or south county would be based on a 40 acre parcel irrigated by means of a buried 6" plastic pipe mainline on the parcel, feeding either a single self-propelled wheeline irrigation machine or a network of hand-set surface-mounted aluminum pipe and sprayfield sprinklers.

To irrigate many of the private parcels in the west county or south county would require installation of a small booster pump station on private property to boost the pressure coming off the distribution mains installed along the public right-of-way. The location, sizing and cost of these booster pump stations are not included in the current project description or cost estimate. We understand they would be the responsibility of the individual private irrigator.

3. What construction activities and equipment are associated with construction of pipelines, pump stations, ASR well stations, direct discharge outlet, urban irrigation, Geysers steamfield piping ?

Our reponse is similar to the RUST memo of 9/28/95 for the reservoirs:

Construction Activities

Construction activities associated with installation of the pipelines and the other localized components listed above would consist, in general, of the following:

- Mobilization of construction equipment
- Locating and leasing site(s) for storage of construction materials and equipment near the construction site or site(s)
- Locating and contracting with private land owners or the county/city for disposal sites for excess excavated materials which will be produced, particularly for the pipelines
- Contracting with quarries for delivery of gravel and asphalt needed for pipeline trenches and pavement restoration

- Clearing and grubbing of sites for the pump stations and ASR wells and direct discharge outlet structure

- Where feasible, stockpile lengths of piping along pipeline alignments

- Delivery of water to construction sites for soil compaction and dust control. Reclaimed water could be used, but Laguna Plant would be too far from most construction sites, so contractor will probably arrange to use potable water from closest hydrant. Reclaimed water from Petaluma wastewater plant and from Windsor wastewater plant may also be used.

- Reconstruct/widen/stabilize portions of Pine Flat Road, to county standards, in preparation for installation of Geysers pipeline along road

- Saw cut edge of asphalt roadbed, break and remove pavement, in preparation for excavation of pipeline trenches

- Excavation of pipeline trench, delivery and placement of pipeline bedding material, installation of pipe sections and valves, delivery and placement of backfill material

- Where pipelines are to cross highways which can't be interrupted by construction activities, or perennial creeks, excavation of jacking pits on either side of highways and creeks and jacking of pipeline underneath the highway and creeks between pits

- Installation of isolation valves, air release valve stations, and blowoff valve stations along pipelines

- Delivery and placement of asphalt pavement for finished pipeline trenches in roads and repaving of roadway pavement damaged by construction

- Construction of new electrical service to pump station sites, ASR well station sites, direct discharge structure site, Geysers tank site. Concurrently, PG&E would, using their forces, extend and reinforce existing local electrical service facilities needed to serve many of these sites.

- Construction new electrical substations and polelines to serve some pump stations (see my memo of Sept 27, 1995): one to serve the "S" pump station, one to serve the "G2, G3, and G4" pump stations, one to serve "SBPS-10", one to serve "SP", and one to serve "T". Construct new poleline from these substations to the pump stations.

- Drilling and development of ASR wells

- Construction of pump stations: buildings, installation of mechanical and electrical equipment, and above-grade steel storage tanks for pump stations "G2, G3, and G4".

- Excavation and construction of direct discharge structure at Russian River

- Construction of appurtenant structures and ancillary facilities such as access driveways to pump stations, ASR well stations, direct discharge structures; fencing; painting, etc.

- At pump stations and ASR well sites, construct radio telemetry equipment for transmission of equipment status and alarm signals to the Laguna Plant. Modify SCADA system at the Laguna Plant as necessary for receipt and display of these radio telemetered signals from pump stations and ASR well sites.

- Clearing and grading of alignment for above-grade pipelines at the Geysers steamfields

- Excavation and construction of pipe support cradles and piers for above-grade pipelines at the Geysers steamfields

- Delivery and installation of above-grade pipelines and valves at the Geysers steamfields

- Grading of site, delivery and construction of above grade steel storage tanks atop ridge above Geysers steamfield

- Testing of pipelines, pump stations, controls and telemetry system

- Site cleanup and demobilization. Restoration of stockpile areas and yards.

Construction Equipment

The most time consuming and equipment-intense construction activity associated with the above-listed components would be for the many miles of pipelines, particularly the large-diameter (36" to 60") transmission and distribution lines. All alternative projects except 1 and 5B would have many miles of such lines, particularly Alternatives 2 and 3.

In order to complete construction of the many miles of pipelines within a reasonable time it will be necessary to break the project construction into several contracts, or to specify the construction schedule accordingly, so that more than one construction crew will be working (at different locations) at the same time. In this way, more men and equipment will be engaged for a shorter construction schedule.

For the various alternative projects the estimated number of construction crews and the total equipment needs (which would be in approximate continuous use during the construction schedule) are as follows:

Equipment	Alternative / Construction Work Crews or Sites Project			
	2 (any)/4	3 (any)/4	4/3	5A/1
Dozers	4	4	3	1
Trench claw-shovel excavator	4	4	3	1
Water truck	4	4	3	1
Self-propelled rollers	4	4	3	1
Backhoe Excavator	4	4	3	1
Skip loaders	4	4	3	1
Dump and tandem gravel trucks (in service/day)	40	40	30	10

Equipment	Alternative / Construction Work Crews or Sites Project			
	2 (any)/4	3 (any)/4	4/3	5A/1
Long-bed flatbed trucks	20	20	15	5
Pick-ups and small flat bed trucks	16	16	12	4
Welding trailers	4	4	3	1
Air compressor trailers	4	4	3	1
Hand-operated compactors	8	8	6	2

The above equipment quantities can be assumed equally distributed among the number of construction crews for a given alternative but, in reality, the equipment spread will vary by construction site for different size pipelines, pipelines versus pump station sites, etc, and will vary during different stages of construction.

Construction Schedule

In general, the driving factor for completion of the above listed work items (excluding the reservoirs) for any of the alternative projects (except 1 and 5B) will be the time to construct the many miles of pipelines proposed. In particular, the time needed to excavate the trenches and to place and weld the sections of larger diameter pipe would take the most time.

Construction of pump stations and electrical substations would also take many months, primarily due to the long lead time needed for manufacture and delivery of the pumps and the electrical controls and transformers.

We estimate that the time to construct the alternative projects can be approximated as follows:

Alternative Project	Total Length of Pipelines (feet)	Diameter Range of Pipelines (inches)	Time to Construct (work days)	(calendar years) (1)(5)
2 (any)	275,000 to 315,000	8" to 60"	490 (2)	1.9
3 (any)	308,000 to 337,000	8" to 60"	435 (2)	1.7
4	187,000	42" to 48"	460 (3)	2.4 (6)
5A	39,000	48" to 54"	260 (4)	1.0

Notes:

(1) Based on 250 workdays per calendar year.
(2) Assuming 4 work crews working simultaneously.
(3) Assuming 3 work crews working simultaneously.
(4) Assuming 1 work crew.
(5) These times are for completion of actual construction activities, not full contract time which would include time for mobilization/demobilization, cleanup, completion of "punch list" (correction of deficient work) and testing of completed project components and system.
(6) Includes additional 6 months time needed for completion of reconstruction/widening/stabilization of portions of Pine Flat Road prior to pipeline construction. This work must be substantially completed before the pipeline contractor can start work up Pine Flat Road.