Appendix 8.5-1

Effluent and Groundwater Quality Data

STAGE 2 ANALYSIS: 2007 CDE PROTOCOL NATURAL GAS PIPELINE RISK ASSESSMENT—FOUR SCHOOL SITES NEAR THE PROPOSED KINGS RIVER CONSERVATION DISTRICT COMMUNITY POWER PLANT 20-INCH DIAMETER HIGH-PRESSURE PIPELINE

Indianola Elementary School, Kings River Elementary School, Traver Joint Elementary School, and Goshen Elementary School--Tulare and Fresno Counties, California

SUMMARY REPORT AND APPENDIX: Based on 2007 CDE Guidance Protocol for School Site Pipeline Risk Analysis

Prepared for:
Navigant Consulting
3100 Zinfandel Drive, Suite 600
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April 2007 [Revised May 2007]

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WILSON GEOSCIENCES INC.
Engineering and Environmental Geology

April 23, 2007
[Revised May 23, 2007]

Amy Cuellar
Navigant Consulting
3100 Zinfandel Drive, Suite 600
Rancho Cordova, California 95670

Subject: TECHNICAL REPORT AND APPENDIX: 2007 CDE Protocol Stage 2 Natural Gas Pipeline Risk Assessment—Four School Sites Near the Kings River Conservation District Community Power Plant 20-Inch Diameter High-Pressure Natural Gas Pipeline, Tulare and Fresno Counties, California

Dear Ms. Cuellar:

1. INTRODUCTION

Background

The Kings River Conservation District (KRCD) is proposing to construct, own, and operate an electrical generating plant near the City of Parlier, in Fresno County. The proposed Kings River Conservation District Community Power Plant (KRCD CPP) is a nominal 565-megawatt (MW) natural gas-fired combined cycle base load power plant. Natural gas for the KRCD CPP will be provided by a new approximately 26-mile long 20-inch diameter underground pipeline interconnection to the Southern California Gas Company (SCG) Line 7000 near Visalia, California. The new gas pipeline will primarily follow existing roads and be located in public right-of-way (Figure 1).

Wilson Geosciences, Inc. (WGI) has prepared this analysis in support of the KRCD CPP Application for Certification (AFC). The KRCD CPP AFC is being submitted to the California Energy Commission (CEC) for its consideration of licensing. Under the Warren Alquist Act (Public Resources Code (PRC) Section 25000 et. seq., the CEC has the responsibility for licensing all power plants in the State of California that are over 50 megawatts in capacity. This report addresses the natural gas pipeline failure risk and the consequences of pipeline failure for four existing schools sites located within 1500-feet of the proposed pipeline. This report is prepared in accordance with the proposed California Department of Education (CDE) protocol for pipeline risk analysis (CDE, 2007), hereinafter referred to as the 2007 CDE protocol. CDE regulations (Title 5, California Code of Regulations, Division 1, Chapter 13, Subchapter 1, School Facilities Construction, Article 2-School Sites, § 14010, Standards for School Site Selection) that took affect in late 2000 require that:

"h. The site shall not be located near an above-ground fuel or water storage tank or within 1500 feet of the easement of an above-ground or underground pipeline that can pose a safety hazard as determined by a risk analysis study, conducted by a competent professional, which may include certification from a local public utility commission."

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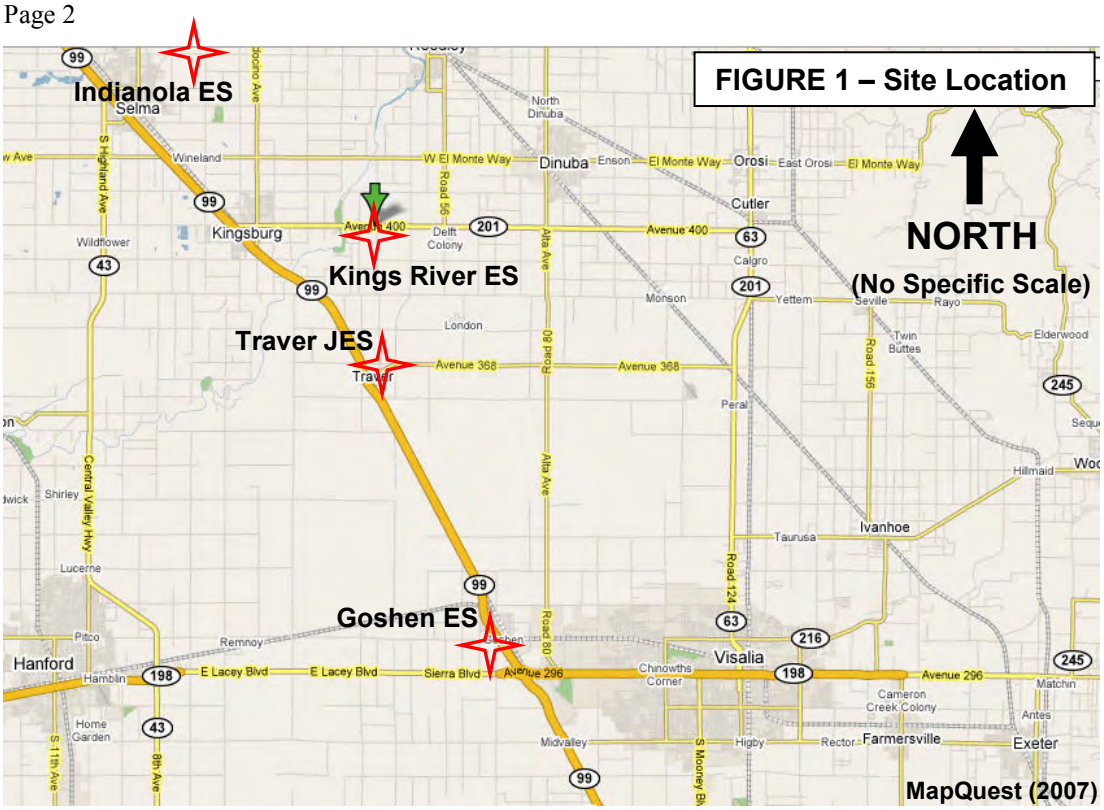
wilsongeo@earthlink.net



This analysis would not be required to comply with applicable CDE regulations as relates to the four existing school sites. However, this analysis was completed in support of the KRCD CPP AFC as a determination of the potential for health and safety risk at the existing school sites posed by the construction of the proposed natural gas pipeline within 1500 feet of these sites. The four school sites within 1500-feet of the pipeline that are the subject of this study listed from north to south are:

- Indianola Elementary School,
- Kings River Elementary School,
- Traver Joint Elementary School, and
- Goshen Elementary School.

Navigant Consulting (Navigant) provided pipeline information, school locations (maps and aerial photograph), and school populations for the four schools (Cuellar, 2007).

<u>Summary: Approach, Results, and Conclusions from the 2007 Protocol Pipeline Risk Analysis</u>

Approach - The 2007 CDE protocol uses a multi-stage approach consisting of Stages 1, 2, and 3. Stage 1 is the Risk Screening Analysis, whereby in certain situations (CDE, 2007, page 4-7) analysis has revealed combinations of pipe size, pressure, product, and distance from the school campus property line that will result in an individual risk (IR) value that will meet the CDE IR criterion of 1 x 10^{-6} probability of fatality of an exposed individual at a specified receptor location. For the four sites in this study, none passed the Stage 1 screening as acceptable due to the proximity and pressure of the proposed KRCD natural gas pipeline. Therefore, a Stage 2 Probabilistic Risk analysis was undertaken. Stage 3, a more detailed

probabilistic analysis, may be required if Stage 2 results do not meet the IR criterion or are otherwise unsatisfactory to the CDE. The steps in the Stage 2 analysis determine the:

1. Hazard impact distance.
2. Pipeline segment length (XSEG) length for each of the three hazard types based on the distance between the receptor and the pipeline hazard source, and the hazard impact distance.
3. Maximum mortality impact from the closest approach of the pipeline to the receptor.
4. Average mortality at the receptor for each XSEG.
5. Base adjusted failure probability for the pipeline.
6. Base probability for each XSEG.
7. Conditional probability factor for each event scenario.
8. Conditional probability of individual exposure.
9. IR at the specified locations.

This report is prepared based on pipeline and mapping data from Navigant Consulting (2007).

Results - This natural gas pipeline risk assessment was conducted according to the 2007 CDE Protocol; the primary steps in the analysis are listed above and any exceptions are noted in the report. WGI developed the geologic hazards and earthquake hazards information to determine if conditions at the four sites are sufficiently more hazardous than the general condition for California and if they warrant application of a Probability Adjustment Factor (PAF) greater than one (1). This adjustment was not required for any of the four sites considered.

Conclusions - The estimated risk levels for each of the four sites, based upon the 2007 CDE Protocol and upon the information provided to WGI, are insignificant, which means the estimated risk levels are lower than the threshold of significance for the Individual Risk Criterion established in the 2007 CDE Protocol. On this basis, mitigation measures to address future pipeline-related health and safety risks at these four school sites may not be required, but could be considered in the future.

Organization of the Report

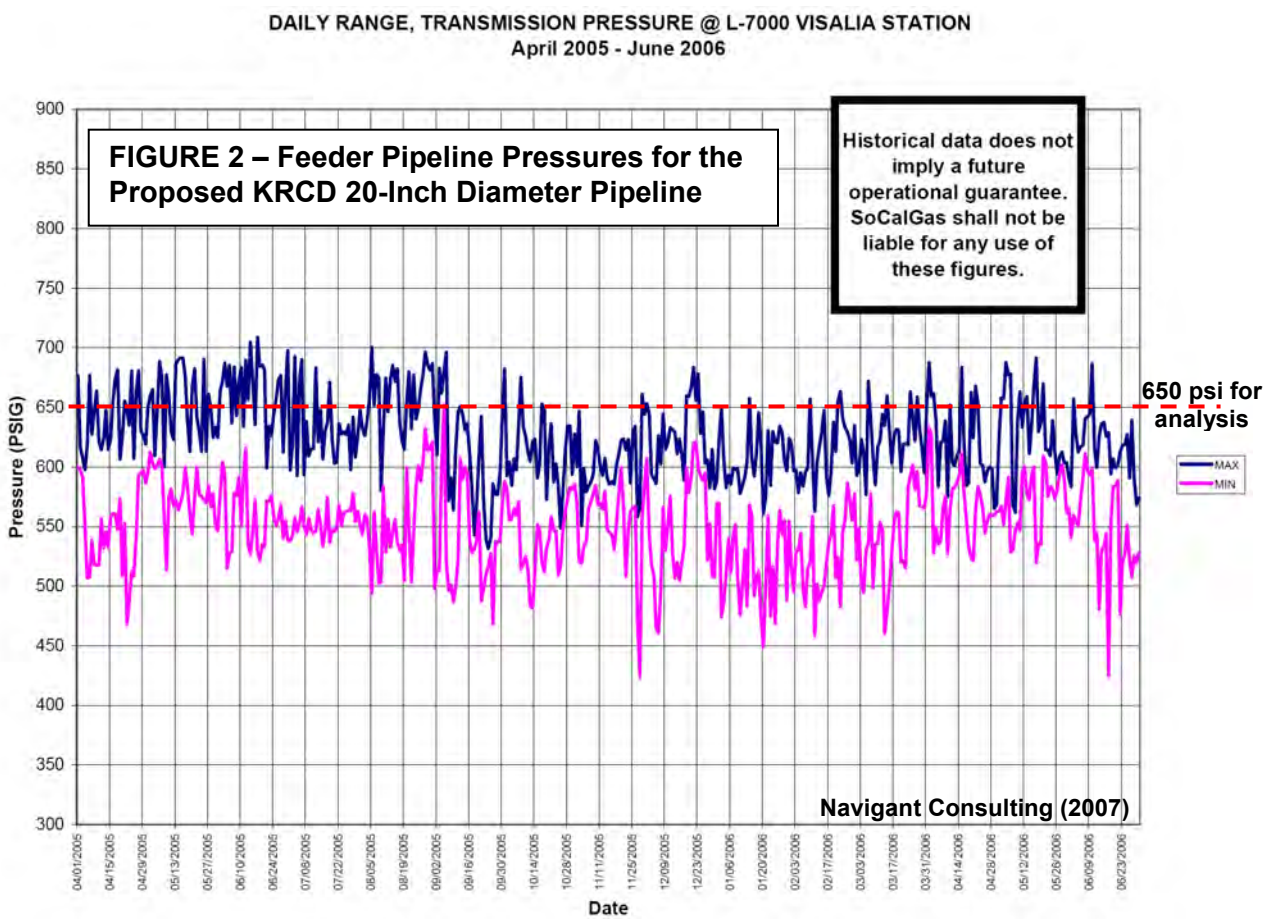
Following this Introduction, Section 2 provides a brief description of the single KRCD 20-inch diameter pipeline and summarizes the local terrain and geology/earthquake conditions, Sections 3, 4, 5, and 6 present the analysis for the four school sites (2007 CDE protocol tables), Section 7 summarizes assumptions related to the site analyses, Section 8 provides a closure statement, and Section 9 indicates the references cited.

The pipeline risk analysis results are presented in Sections 3 through 6, which provide the Standard CDE Forms 1 through 5 as required by the 2007 CDE protocol Stage 2 risk analysis (CDE, 2007). This analysis would not be required to comply with applicable CDE regulations, but is being prepared for and submitted to the CEC in support of the KRCD CPP AFC. Information on the 2007 CDE protocol process can be obtained from Mr. Michael O'Neill (916 322-1463 and MOneill@cde.ca.gov) at the CDE Sacramento.

2. PIPELINE CHARACTERISTICS AND TOPOGRAPHIC, GEOLOGIC, AND EARTHQUAKE SETTINGS

Pipeline Characteristics

The analysis considered one proposed 20-inch diameter high-pressure natural gas transmission pipeline. Based on topographic maps and aerial photos, the high-pressure natural gas transmission section of interest trends generally north-to-south, with numerous jogs, from Fresno County on the north into Tulare County on the south. The line will be constructed with the next several years and will be a modern pipeline with all required design and safety features to satisfy the requirements of the California Public Utilities Commission (CPUC) and the federal Office of Pipeline Safety. The pipeline is planned to operate at the pressure of the SCGC feeder system. A representative graphical representation of the pressure distribution for this pipeline is presented as Figure 2 (Navigant, 2007). We selected 650 pounds per square inch (psi) as a reasonable maximum pressure for the feeder pipeline and for our analysis based on the data shown in Figure 2.



As noted in Figure 2, the pipeline may be operated approximately 150 to 250 psi (KRCD, from M. Watson, 2005). Based on the installation date, the line is constructed of steel and is maintained under modern regulatory standards. ABS Consulting (Appendix A)

analyzed this information and calculated the estimated annual failure probability based on previous information for similar pipelines and on information from past research on this subject.

Topography and Drainage

All four existing school sites are in areas of fairly level, west to south sloping topography developed within the eastern San Joaquin Valley. The Indianola ES school site (Selma Quadrangle) is at approximately the same elevation (320 to 325 feet above mean sea level [amsl]) as the proposed pipeline, which will be approximately 1,380-feet to the east of the campus, with no intervening topographic features. At the Kings River ES site (Reedley Quadrangle) at the proposed pipeline will also be east of the site (about 50 feet), the elevations of each range from 305 to 310-feet amsl, and there are no intervening topographic features. Farther south at the Traver Joint ES site (Traver Quadrangle), elevations are 285 to 290-feet amsl for the pipeline and the site, with the pipeline to the north and west of the site (approximately 195 at closest approach), and no intervening topographic features. Goshen ES is the southernmost site and is located approximately 300-feet east of the proposed pipeline; elevations range between 277 and 283 feet amsl and there are no intervening topographic features. At all four sites the ground slope is less than one percent and surface drainage along the pipeline is by sheet flow, small local erosion channels, or in a local canal (at Kings River ES).

Geology and Earthquake Considerations

The surface geology in and around all of the sites consists of younger alluvial deposits shed from the east toward the central portion of the San Joaquin Valley. In general the sites and nearby proposed pipeline is underlain by Holocene younger alluvial fan material consisting of poorly consolidated sand, silt, clay, and gravel. The California Geological Survey has not classified the alluvium units a part of a quadrangle wide liquefaction evaluation. The poorly consolidated Holocene alluvium is very likely saturated within the upper 30 to 50 feet and liquefaction at the sites is a possibility, although soil types in the area are not conducive to liquefaction because they are either too coarse-grained or contain too much clay to be liquefaction-prone (County of Fresno, 2000).

There are no mapped faults in the immediate vicinity of the four sites. Regional faults to the west are the Great Valley blind thrusts and the San Andreas, to the south the White Wolf, and the to the north the Foothills fault system (Figure 3). All of these faults are capable of large magnitude earthquakes (magnitude greater than 6.0), but due to the substantial distances to the four sites ground acceleration levels do not exceed normal building code design standards (less than 40% the force of gravity). There are no Alquist-Priolo Earthquake Fault Zones near the sites.

Based on the topographic, drainage, geologic and earthquake conditions along the pipeline near the sites, we do not believe the likelihood of these natural hazards impacting the stability of the pipeline are greater than the regional conditions in California considered in determining pipeline failure probabilities (CDE, 2007).

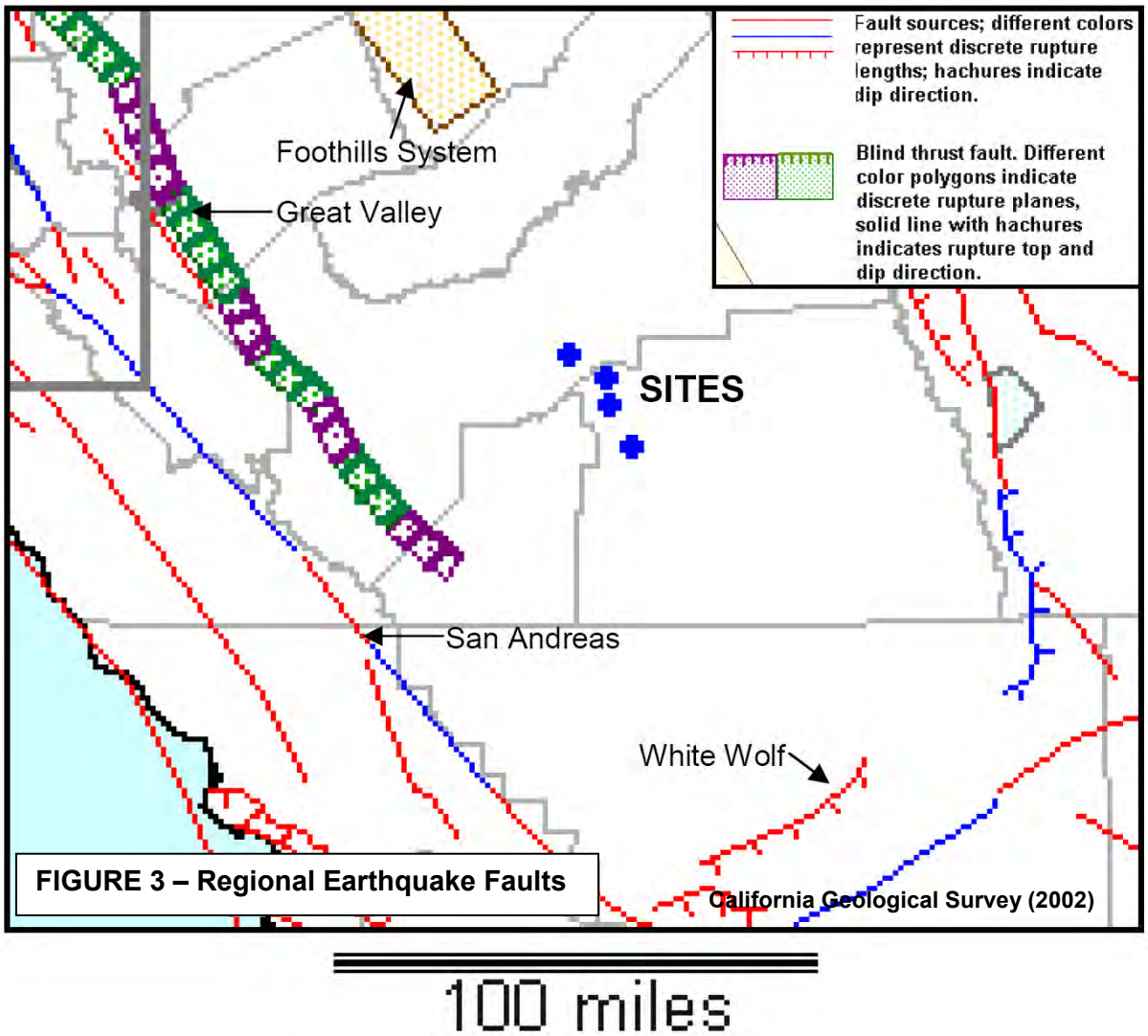


FIGURE 3 – Regional Earthquake Faults

3. INDIANOLA ELEMENTARY SCHOOL SITE

This subsection presents the Forms 1through 5 required by the Stage 2 risk analysis protocol. Figure 4 shows (a) the site with respect to local roads (right), (b) various measurement distances, and (c) the potential impact zones 1, 2, and 3 (below).

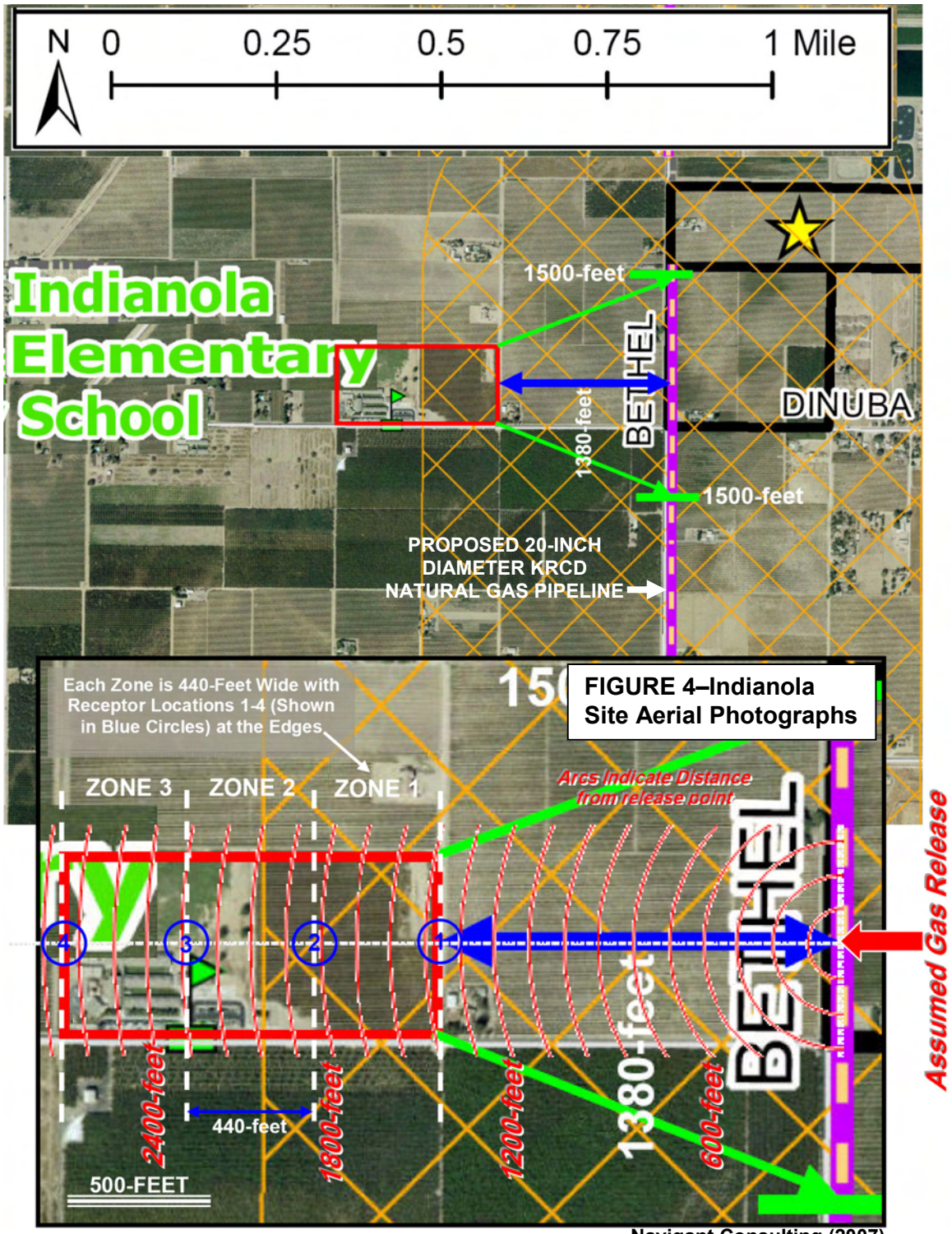


FIGURE 4–Indianola Site Aerial Photographs

Navigant Consulting (2007)

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 1 – Administrative, Summary, and Signature Form

Local Educational Agency	
Date	April 20, 2007
Local Educational Agency	Selma Unified School District
Contact (First and Last Name)	Not Applicable
Telephone Number	Not Applicable
E-mail Address	Not Applicable
Street Address	Not Applicable
Department or Mail Drop	Not Applicable
City	Not Applicable
County	Not Applicable
Zip Code	Not Applicable
Existing School Campus Site	
Name (Site Identifier)	Indianola Elementary School
Location Description (Brief description of the property and its boundaries. Copy and attach a more detailed description as needed.)	11524 East Dinuba Avenue, Selma, CA 93662 South of East Manning Avenue, west of South McCall Avenue, north of Dinuba Avenue, and east of South Bethel Avenue (36.5915 North and 119.5816 West).
Pipeline of Interest	
Operator / Owner	Future SCGC will operate and KRCD CPP will build
Product Transported	Natural Gas
Pipeline Diameter (inches)	20
Operating Pressure (psig)	Varies 450 to 700 psig; 650 psig used in the analysis.
Closest Approach to Property Line (or boundary between the usable and unusable portion of the site if the unusable portion faces the pipeline.) (ft)	1380

Individual Risk Estimate Result						
Type of Analysis (Check One)	**Stage 1 →**	☐	**Stage 2 →**	☒	**Stage 3 →**	☐
Individual Risk Estimate Value	**4.3E-09**					
Individual Risk Criterion	**1.0E-06 (0.000001)**					
IR Significance (check one)	**Significant**	☐				
	Insignificant	☒				

(Continued on next page)

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 1 – Administrative, Summary, and Signature Form
(Continued from previous page)

Population Risk Indicator Result	
Protocol Average IR	**3.38E-09**
IR Indicator Ratio (Average IR / Property Line IR)	**0.78**
Population Risk Indicator	**0**

Prevention and Mitigation Recommendations/Implementations (☐See Attached)
Prevention Measures: Possible Future Consideration
Mitigation Measures: Possible Future Consideration
Assumptions/Conclusions/Other Suggestions/Recommendations: (☐See attached sheets)
See Section 7

Certification and Signatures of Risk Analyst(s)

This analysis was conducted according to the 2007 CDE Protocol except as noted. All modifications within the Stage 2 framework, and Stage 3 analyses and exceptions to the data and processes established in the 2007 CDE Protocol, if any, were based upon my professional opinion and in a manner consistent with the standards of care and skill ordinarily exercised by professionals working on similar projects.

I certify that the estimated risk levels were derived based upon the 2007 CDE Protocol, unless otherwise noted, and that these levels demonstrate, within reasonable expectations of uncertainties for such estimates, that the estimated Individual Risk for the school site, as the site was planned at the time of this analysis, including mitigation measures, if any, meets the Individual Risk Criterion stated in the 2007 CDE Protocol, based on the information provided to me.

Printed Name	Signature	Position or Title
Kenneth Wilson, PG 3175		Principal Geologist

Notice: In the event that the Individual Risk Criterion could not be met, at the option of the LEA, CDE will still accept a report for review and consultation with the LEA.

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 2 - Pipeline Risk Analysis Input Data

Date: April 20, 2007		
Local Educational Agency: Tulare County Office of Education		
Existing School Site Name: Existing School is Indianola Elementary School		
Existing School Current Population: Existing population is 525 students (Navigant, 2007)		
Product	*Designate by an "X"*	
Natural gas (NG)	☒	*KRCD CPP*
Crude oil	☐	
Gasoline	☐	
Liquefied natural gas (LNG)	☐	
Liquefied petroleum gas (LPG)	☐	
Natural gas liquids (NGL)	☐	
Other refined product (specify)	☐	
Other substance (specify)	☐	
Pipeline Location Attributes	*Units*	**Value**
Segment length	ft	1730
Closest approach to property line	ft	1380
Closest approach to usable portion of the school site	ft	1380
Land use by class location (49 CFR Part 192)	Class	1
Pipeline Attributes		
Diameter	inches	20
Maximum operating pressure	psig	700
Average operating pressure	psig	650 (Average max.)
Depth of burial	ft	Top 36-inches
Distance to nearest compressor (gas) or pump station (liquid)	ft	Unknown
Throughput		NA
Liquid (enter value, meter, etc.)	gpm	NA
Nearest block valve locations, upstream and downstream of segment of concern		Unknown
Above ground components within 1500-ft zone		None
Number		NA
Type		NA
Pipeline location on terrain gradient relative to school (Designate with an "X" by appropriate description)		
Flat		☒
Up gradient		☐
Down gradient		☒
"Convoluted"		☐

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 3 - Standard Protocol Calculation Summary

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
Basic Data Input				
	Baseline frequency per pipeline mile	F0, releases/ mile-year	1.2E-04	Historical or default release frequency from Table 4-3 or Appendix B.
	Segment length within 1500-ft buffer	SEG, Miles	1730	Determine from site maps, GIS, or other sources
	Nearest property line distance	R0, ft	1380	Determine from maps
	Receptor location distance, if different than nearest property line	R(i), ft	1380	Determine from maps
	Base release probability	P0	1.2E-04	$P0 = 1 - e^{(-F0 \times t)}$
	Probability adjustment factor	PAF	1	Default value selected by analyst
	Adjusted base probability	PA	1.2E-04	PA = P0 × PAF

Special Seismic Considerations

Please summarize and/or list below any adjustments made to the Protocol base risk analysis estimates and the special seismic conditions and studies upon which these adjustments were based. If adjustments were based upon special seismic conditions, the signature(s) and titles of those professionals involved are required. Attach additional pages if needed.

See Section 2 and Figure 3.

Signatures for Above, If Needed

Printed Name	Signature	Title
Kenneth Wilson, PG 3175		Principal Geologist

Protocol Basis Scenario Probabilities

	XSEG length, leak, ft:	Variable	Value	ALOHA Modeling Indicates
	Leak jet or pool fire	ft	33	For 1.0-inch hole
	Leak flash fire	ft	0	No explosion overpressure for leaks.

(Continued on next page)

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
	Leak gas or vapor explosion	ft	0	No explosion overpressure for rupture.
	Individual XSEG failure and release probabilities, leak, PA(LX):			
	Leak jet or pool fire	PA(LJF)	0	
	Leak flash fire	PA(LFF)	0	
	Leak gas or vapor explosion	PA(LEX)	0	
	XSEG length, rupture, ft:			
	Rupture jet or pool fire	ft	0	R(i) slightly different non-parallel pipe
	Rupture flash fire	ft	5328	R(i) slightly different non-parallel pipe
	Rupture gas or vapor explosion	ft	0	
	Individual XSEG failure and release probabilities, rupture, PA(RX):			
	Rupture jet or pool fire	PA(RJF)	2.7E-05	
	Rupture flash fire	PA(RFF)	1.4E-04	
	Rupture gas or vapor explosion	PA(REX)	0	

Insert Protocol default values or exceptions to the Protocol default values:				**(If values other than Protocol default values were used, indicate the value in the appropriate cell and indicate the data source.)**
	Probability of leak	PC(L)	0.8	Default: 0.8
	Probability of rupture	PC(R)	0.2	Default: 0.2
	Probability of leak ignition	PC(LIG)	0.3	Default: gas 0.3 (FEMA 1989); gasoline, 0,09; liquids other than gasoline (e.g., crude oil): 0.03
	Probability of rupture ignition	PC(RIG)	0.45	Default: gas 0.45 (FEMA 1989); gasoline: 0.09; liquids other than gasoline (e.g., crude oil): 0.03

(Continued on next page)

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 3 - Standard Protocol Calculation Summary

(Continued from previous page)

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
Insert Protocol default values or exceptions to the Protocol default values:				**(If value other than default used, indicate value in appropriate column and indicate data source.)**
	Probability of fire on ignition	PC(FIG)	0.99	Default: gas 0.99 (FEMA 1989); liquid 0.95
	Probability of explosion on ignition	PC(EIG)	0.01	Default: gas 0.01; liquid 0.05
	Probability of flash fire	PC(FF)	0.01	Default: gas 0.01; liquid 0.05
	Probability of jet fire (gas pipelines) or pool fire (liquid pipelines)	PC(JF)	0.98	Default: gas = 0.98; liquid = 0.95
	Probability of occupancy	PC(OCC)	0.16	Default: 180 days per year, 8 hrs per day.
	Probability of outdoor exposure	PC(OUT)	0.25	Default: 2 hr outdoors during an 8-hour day onsite.
	Probability of leak jet/pool fire impact	PCI(LJF)	0.23	Determined from Table 4-7
	Probability of rupture jet/pool fire impact	PCI(RJF)	0.09	Determined from Table 4-7
	Probability of leak flash fire impact	PCI(LFF)	0.002	Determined from Table 4-7
	Probability of rupture flash fire impact	PCI(RFF)	0.001	Determined from Table 4-7
	Probability of leak explosion impact	PCI(LEX)	0.002	Determined from Table 4-7
	Probability of rupture explosion impact	PCI(REX)	0.001	Determined from Table 4-7
Individual Risk Summary				
	Leak jet fire IR	IR(LJF)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture jet fire IR	IR(RJF)	0.0E+00	2007 CDE protocol spreadsheet
	Leak flash fire IR	IR(LFF)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture flash fire IR	IR(RFF)	4.6E-09	2007 CDE protocol spreadsheet
	Leak explosion IR	IR(LEX)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture explosion IR	IR(REX)	0.0E+00	2007 CDE protocol spreadsheet
Total IR and IRC				
	Total Individual Risk	TIR	**4.3E-09**	2007 CDE protocol spreadsheet
	CDE Individual Risk Criterion	IRC	**1.0E-06**	
Check shaded boxes as follows:				
	If TIF / IRC > 1.0	☐		"Significant"
	If TIF / IRC < =1.0	☒		"Insignificant"
IR and Population Risk Indicators				
	IR Indicator	☒	**0.00**	2007 CDE protocol spreadsheet
	Population Risk Indicator	☒	**0.78**	2007 CDE protocol spreadsheet

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 4 - Alternative Calculations Summary

School Site: Indianola Elementary School

Listing of Attached Alternative Documentation: No alternative calculations were made.

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 5 - Supplementary Documentation

School Site: Indianola Elementary School

Listing of Attached Supplementary Documentation:

Indianola Average TIR Index for Gas Release (All Viable Hazards)

Zone Boundary	Boundary Distance from Pipeline (Feet)	TIR (Probability)
Begin Zone 1 (nearest property boundary)	1380	4.30E-09
Begin zone 2	1820	3.90E-09
Begin zone 3	2260	3.20E-09
End Zone 3 (farthest property boundary)	2700	2.10E-09
	Average TIR	**3.38E-09**
	TIR Indicator Ratio	**0.78**

Indianola Population Risk Indicator for Gas Release (All Viable Hazards)

Zone	Distance from Pipeline (Feet)		Zone Boundary Mortalities (All hazards in %)		Simple Average Zone Mortality (All hazards in %)	Population (In/Out = *Percentage* of indoor/outdoor area within a Zone and the number of indoor (30%)/ outdoor *Persons* within a Zone)				Zone Populations	Population Risk Indicators
						Percentage		*Persons*			
	Begin	End	Begin	End		In	Out	In	Out		
1	1380	1820	0.0%	0.0%	0.0%	0.0%	33.3%	104.4	44.8	45	0.0
2	1820	2260	0.0%	0.0%	0.0%	22.0%	11.3%	104.4	44.8	45	0.0
3	2260	2700	0.0%	0.0%	0.0%	16.5%	16.9%	104.7	44.9	45	0.0
					Totals→	38.5%	61.5%	313.6	134.4	134	
Total Site Population→			**448**			**Total Population Risk Indicator→**					**0**

4. KINGS RIVER ELEMENTARY SCHOOL SITE

This subsection presents the Forms 1through 5 required by the Stage 2 risk analysis protocol. Figure 5 shows (a) the site with respect to local roads (right), (b) various measurement distances, and (c) the potential impact zones 1, 2, and 3 (below).

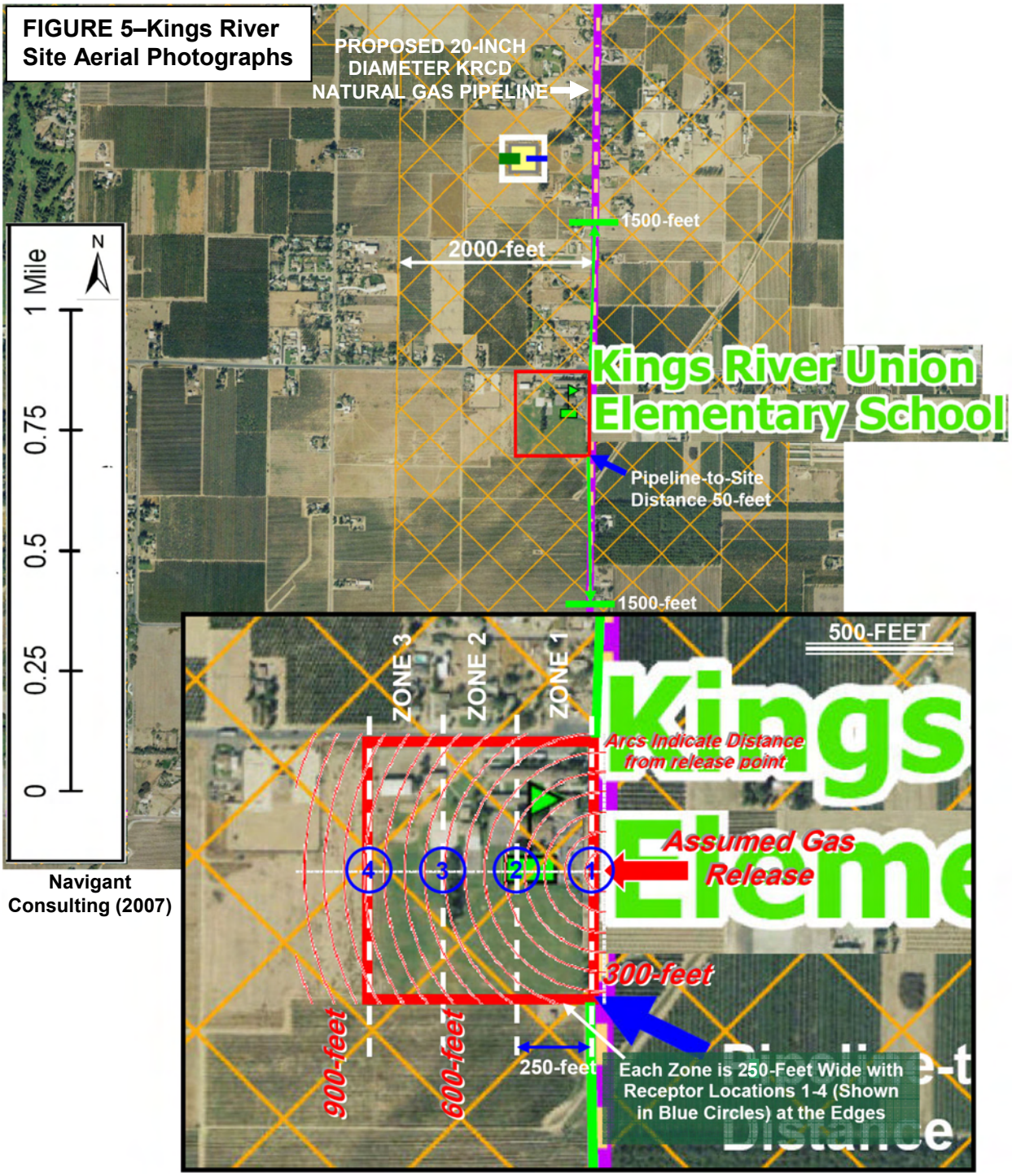


FIGURE 5–Kings River Site Aerial Photographs

Navigant Consulting (2007)

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 1 – Administrative, Summary, and Signature Form

Local Educational Agency	
Date	April 20, 2007
Local Educational Agency	Tulare County Office of Education
Contact (First and Last Name)	Not Applicable
Telephone Number	Not Applicable
E-mail Address	Not Applicable
Street Address	Not Applicable
Department or Mail Drop	Not Applicable
City	Not Applicable
County	Not Applicable
Zip Code	Not Applicable
Existing School Campus Site	
Name (Site Identifier)	Kings River Elementary School
Location Description (Brief description of the property and its boundaries. Copy and attach a more detailed description as needed.)	3961 Avenue 400, Kingsburg, CA 93631 South of Avenue 400 (Hwy 201), west of Road 36, north of Avenue 390, and east of Road 40 (36.5159 North and 119.4869 West).
Pipeline of Interest	
Operator / Owner	Future SCGC will operate and KRCD CPP will build
Product Transported	Natural Gas
Pipeline Diameter (inches)	20
Operating Pressure (psig)	Varies 450 to 700 psig; 650 psig used in the analysis.
Closest Approach to Property Line (or boundary between the usable and unusable portion of the site if the unusable portion faces the pipeline.) (ft)	300

Individual Risk Estimate Result						
Type of Analysis (Check One)	**Stage 1 →**	☐	**Stage 2 →**	☒	**Stage 3 →**	☐
Individual Risk Estimate Value	**8.3E-08**					
Individual Risk Criterion	**1.0E-06 (0.000001)**					
IR Significance (check one)	**Significant**	☐				
	Insignificant	☒				

(Continued on next page)

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 1 – Administrative, Summary, and Signature Form
(Continued from previous page)

Population Risk Indicator Result	
Protocol Average IR	**2.43E-08**
IR Indicator Ratio (Average IR / Property Line IR)	**0.29**
Population Risk Indicator	**79**

Prevention and Mitigation Recommendations/Implementations (☐See Attached)
Prevention Measures: Possible Future Consideration
Mitigation Measures: Possible Future Consideration
Assumptions/Conclusions/Other Suggestions/Recommendations: (☐See attached sheets)
See Section 7

Certification and Signatures of Risk Analyst(s)

This analysis was conducted according to the 2007 CDE Protocol except as noted. All modifications within the Stage 2 framework, and Stage 3 analyses and exceptions to the data and processes established in the 2007 CDE Protocol, if any, were based upon my professional opinion and in a manner consistent with the standards of care and skill ordinarily exercised by professionals working on similar projects.

I certify that the estimated risk levels were derived based upon the 2007 CDE Protocol, unless otherwise noted, and that these levels demonstrate, within reasonable expectations of uncertainties for such estimates, that the estimated Individual Risk for the school site, as the site was planned at the time of this analysis, including mitigation measures, if any, meets the Individual Risk Criterion stated in the 2007 CDE Protocol, based on the information provided to me.

Printed Name	Signature	Position or Title
Kenneth Wilson, PG 3175		Principal Geologist

Notice: In the event that the Individual Risk Criterion could not be met, at the option of the LEA, CDE will still accept a report for review and consultation with the LEA.

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 2 - Pipeline Risk Analysis Input Data

Date: April 20, 2007		
Local Educational Agency: Tulare County Office of Education		
Existing School Site Name: Existing School is Kings River Elementary School		
Existing School Current Population: Existing population is 525 students (Navigant, 2007)		
Product	*Designate by an "X"*	
Natural gas (NG)	☒	*KRCD CPP*
Crude oil	☐	
Gasoline	☐	
Liquefied natural gas (LNG)	☐	
Liquefied petroleum gas (LPG)	☐	
Natural gas liquids (NGL)	☐	
Other refined product (specify)	☐	
Other substance (specify)	☐	
Pipeline Location Attributes	*Units*	**Value**
Segment length	ft	3860
Closest approach to property line	ft	50
Closest approach to usable portion of the school site	ft	50
Land use by class location (49 CFR Part 192)	Class	3
Pipeline Attributes		
Diameter	inches	20
Maximum operating pressure	psig	700
Average operating pressure	psig	650 (Average max.)
Depth of burial	ft	Top 36-inches
Distance to nearest compressor (gas) or pump station (liquid)	ft	Unknown
Throughput		NA
Liquid (enter value, meter, etc.)	gpm	NA
Nearest block valve locations, upstream and downstream of segment of concern		Unknown
Above ground components within 1500-ft zone		None
Number		NA
Type		NA
Pipeline location on terrain gradient relative to school (Designate with an "X" by appropriate description)		
Flat		☒
Up gradient		☒
Down gradient		☐
"Convoluted"		☐

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 3 - Standard Protocol Calculation Summary

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
Basic Data Input				
	Baseline frequency per pipeline mile	F0, releases/ mile-year	1.2E-04	Historical or default release frequency from Table 4-3 or Appendix B.
	Segment length within 1500-ft buffer	SEG, Miles	3860	Determine from site maps, GIS, or other sources
	Nearest property line distance	R0, ft	50	Determine from maps
	Receptor location distance, if different than nearest property line	R(i), ft	50	Determine from maps
	Base release probability	P0	1.2E-04	$P0 = 1 - e^{(-F0 \times t)}$
	Probability adjustment factor	PAF	1	Default value selected by analyst
	Adjusted base probability	PA	1.2E-04	PA = P0 × PAF

Special Seismic Considerations

Please summarize and/or list below any adjustments made to the Protocol base risk analysis estimates and the special seismic conditions and studies upon which these adjustments were based. If adjustments were based upon special seismic conditions, the signature(s) and titles of those professionals involved are required. Attach additional pages if needed.

See Section 2 and Figure 3.

Signatures for Above, If Needed

Printed Name	Signature	Title
Kenneth Wilson, PG 3175		Principal Geologist

Protocol Basis Scenario Probabilities

	XSEG length, leak, ft:	Variable	Value	ALOHA Modeling Indicates
	Leak jet or pool fire	ft	33	For 1.0-inch hole
	Leak flash fire	ft	140	No explosion overpressure for leaks.

(Continued on next page)

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
	Leak gas or vapor explosion	ft	0	No explosion overpressure for rupture.
	Individual XSEG failure and release probabilities, leak, PA(LX):			
	Leak jet or pool fire	PA(LJF)	0	
	Leak flash fire	PA(LFF)	5.9E-06	
	Leak gas or vapor explosion	PA(LEX)	0	
	XSEG length, rupture, ft:			
	Rupture jet or pool fire	ft	974	R(i) slightly different non-parallel pipe
	Rupture flash fire	ft	5999	R(i) slightly different non-parallel pipe
	Rupture gas or vapor explosion	ft	262	
	Individual XSEG failure and release probabilities, rupture, PA(RX):			
	Rupture jet or pool fire	PA(RJF)	2.7E-05	
	Rupture flash fire	PA(RFF)	1.4E-04	
	Rupture gas or vapor explosion	PA(REX)	0	

Insert Protocol default values or exceptions to the Protocol default values:				**(If values other than Protocol default values were used, indicate the value in the appropriate cell and indicate the data source.)**
	Probability of leak	PC(L)	0.8	Default: 0.8
	Probability of rupture	PC(R)	0.2	Default: 0.2
	Probability of leak ignition	PC(LIG)	0.3	Default: gas 0.3 (FEMA 1989); gasoline, 0,09; liquids other than gasoline (e.g., crude oil): 0.03
	Probability of rupture ignition	PC(RIG)	0.45	Default: gas 0.45 (FEMA 1989); gasoline: 0.09; liquids other than gasoline (e.g., crude oil): 0.03

(Continued on next page)

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 3 - Standard Protocol Calculation Summary

(Continued from previous page)

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
Insert Protocol default values or exceptions to the Protocol default values:				**(If value other than default used, indicate value in appropriate column and indicate data source.)**
	Probability of fire on ignition	PC(FIG)	0.99	Default: gas 0.99 (FEMA 1989); liquid 0.95
	Probability of explosion on ignition	PC(EIG)	0.01	Default: gas 0.01; liquid 0.05
	Probability of flash fire	PC(FF)	0.01	Default: gas 0.01; liquid 0.05
	Probability of jet fire (gas pipelines) or pool fire (liquid pipelines)	PC(JF)	0.98	Default: gas = 0.98; liquid = 0.95
	Probability of occupancy	PC(OCC)	0.16	Default: 180 days per year, 8 hrs per day.
	Probability of outdoor exposure	PC(OUT)	0.25	Default: 2 hr outdoors during an 8-hour day onsite.
	Probability of leak jet/pool fire impact	PCI(LJF)	0.23	Determined from Table 4-7
	Probability of rupture jet/pool fire impact	PCI(RJF)	0.09	Determined from Table 4-7
	Probability of leak flash fire impact	PCI(LFF)	0.002	Determined from Table 4-7
	Probability of rupture flash fire impact	PCI(RFF)	0.001	Determined from Table 4-7
	Probability of leak explosion impact	PCI(LEX)	0.002	Determined from Table 4-7
	Probability of rupture explosion impact	PCI(REX)	0.001	Determined from Table 4-7
Individual Risk Summary				
	Leak jet fire IR	IR(LJF)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture jet fire IR	IR(RJF)	7.73E-08	2007 CDE protocol spreadsheet
	Leak flash fire IR	IR(LFF)	5.65E-10	2007 CDE protocol spreadsheet
	Rupture flash fire IR	IR(RFF)	4.86E-09	2007 CDE protocol spreadsheet
	Leak explosion IR	IR(LEX)	0.00E+00	2007 CDE protocol spreadsheet
	Rupture explosion IR	IR(REX)	0.00E+00	2007 CDE protocol spreadsheet
Total IR and IRC				
	Total Individual Risk	TIR	**8.3E-08**	2007 CDE protocol spreadsheet
	CDE Individual Risk Criterion	IRC	**1.0E-06**	
Check shaded boxes as follows:				
	If TIF / IRC > 1.0	☐		"Significant"
	If TIF / IRC < =1.0	☒		"Insignificant"
IR and Population Risk Indicators				
	IR Indicator	☒	**0.08**	2007 CDE protocol spreadsheet
	Population Risk Indicator	☒	**0.29**	2007 CDE protocol spreadsheet

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 4 - Alternative Calculations Summary

School Site: Kings River Elementary School

Listing of Attached Alternative Documentation: No alternative calculations were made.

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 5 - Supplementary Documentation

School Site: Kings River Elementary School

Listing of Attached Supplementary Documentation:

Kings River Average TIR Index for Gas Release (All Viable Hazards)

Zone Boundary	Boundary Distance from Pipeline (Feet)	TIR (Probability)
Begin Zone 1 (nearest property boundary)	50	8.3E-08
Begin zone 2	300	4.80E-09
Begin zone 3	550	4.80E-09
End Zone 3 (farthest property boundary)	800	4.70E-09
	Average TIR	**2.43E-08**
	TIR Indicator Ratio	**0.29**

Kings River Population Risk Indicator for Gas Release (All Viable Hazards)

Zone	Distance from Pipeline (Feet)		Zone Boundary Mortalities (All hazards in %)		Simple Average Zone Mortality (All hazards in %)	Population (In/Out = *Percentage* of indoor/outdoor area within a Zone and the number of indoor (30%)/ outdoor *Persons* within a Zone)				Zone Populations	Population Risk Indicators
						Percentage		*Persons*			
	Begin	End	Begin	End		In	Out	In	Out		
1	50	300	100.0%	100.0%	100.0%	10.8%	22.5%	122.4	52.4	52	52.4
2	300	550	100.0%	0.0%	50.0%	10.7%	22.5%	122.0	52.3	52	26.1
3	550	800	0.0%	0.0%	0.0%	3.5%	30.0%	123.1	52.8	53	0.0
					Totals→	25.0%	75.0%	367.5	157.5	158	
Total Site Population→			**525**			**Total Population Risk Indicator→**					**79**

5. TRAVER JOINT ELEMENTARY SCHOOL SITE

This subsection presents the Forms 1through 5 required by the Stage 2 risk analysis protocol. Figure 6 shows (a) the site with respect to local roads (right), (b) various measurement distances, and (c) the potential impact zones 1, 2, and 3 (below).

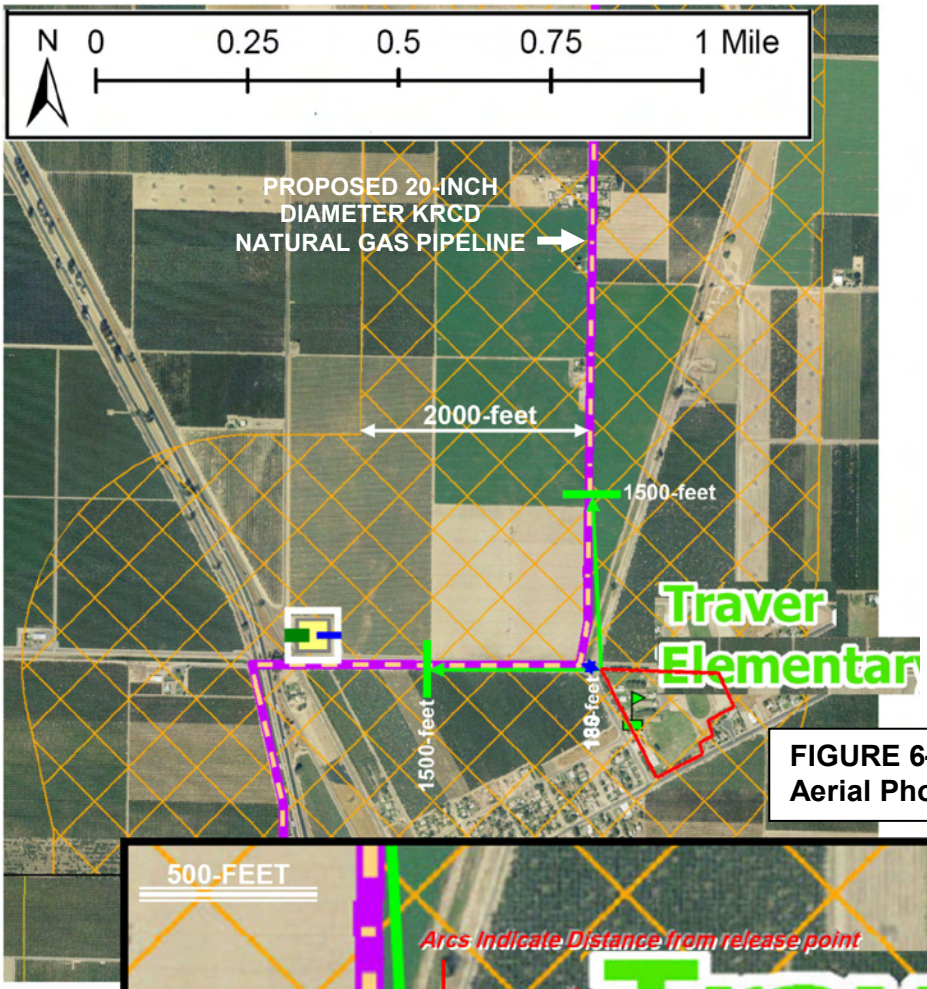
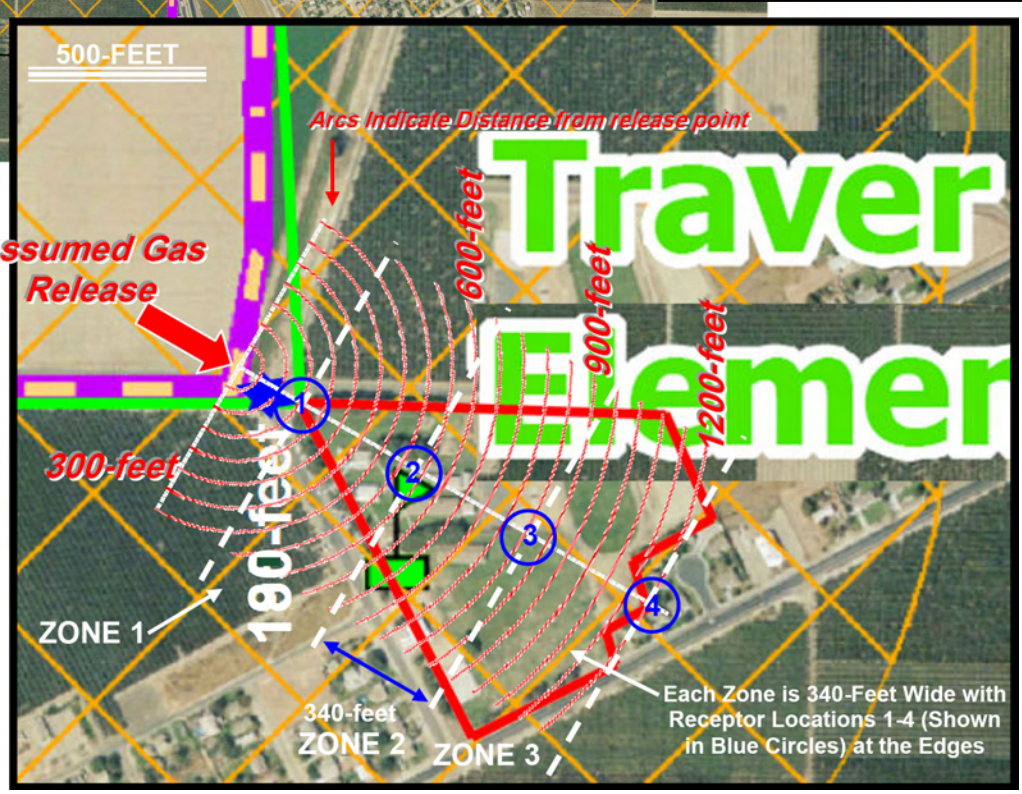


FIGURE 6–Traver Site Aerial Photographs



Navigant Consulting (2007)

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 1 – Administrative, Summary, and Signature Form

Local Educational Agency	
Date	April 20, 2007
Local Educational Agency	Tulare County Office of Education
Contact (First and Last Name)	Not Applicable
Telephone Number	Not Applicable
E-mail Address	Not Applicable
Street Address	Not Applicable
Department or Mail Drop	Not Applicable
City	Not Applicable
County	Not Applicable
Zip Code	Not Applicable
Existing School Campus Site	
Name (Site Identifier)	Traver Joint Elementary School
Location Description (Brief description of the property and its boundaries. Copy and attach a more detailed description as needed.)	36736 Canal Dr, Traver, CA 93673 South of Avenue 368, west of Canal Drive, north of Merritt Drive, and east of Willis Drive (36.4580 North and 119.4812 West).
Pipeline of Interest	
Operator / Owner	Future SCGC will operate and KRCD CPP will build
Product Transported	Natural Gas
Pipeline Diameter (inches)	20
Operating Pressure (psig)	Varies 450 to 700 psig; 650 psig used in the analysis.
Closest Approach to Property Line (or boundary between the usable and unusable portion of the site if the unusable portion faces the pipeline.) (ft)	300

Individual Risk Estimate Result						
Type of Analysis (Check One)	**Stage 1 →**	☐	**Stage 2 →**	☒	**Stage 3 →**	☐
Individual Risk Estimate Value	**7.8E-08**					
Individual Risk Criterion	**1.0E-06 (0.000001)**					
IR Significance (check one)	**Significant**	☐				
	Insignificant	☒				

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California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 1 – Administrative, Summary, and Signature Form
(Continued from previous page)

Population Risk Indicator Result	
Protocol Average IR	**2.35E-08**
IR Indicator Ratio (Average IR / Property Line IR)	**0.30**
Population Risk Indicator	**9**

Prevention and Mitigation Recommendations/Implementations (☐See Attached)
Prevention Measures: Possible Future Consideration
Mitigation Measures: Possible Future Consideration
Assumptions/Conclusions/Other Suggestions/Recommendations: (☐See attached sheets)
See Section 7

Certification and Signatures of Risk Analyst(s)

This analysis was conducted according to the 2007 CDE Protocol except as noted. All modifications within the Stage 2 framework, and Stage 3 analyses and exceptions to the data and processes established in the 2007 CDE Protocol, if any, were based upon my professional opinion and in a manner consistent with the standards of care and skill ordinarily exercised by professionals working on similar projects.

I certify that the estimated risk levels were derived based upon the 2007 CDE Protocol, unless otherwise noted, and that these levels demonstrate, within reasonable expectations of uncertainties for such estimates, that the estimated Individual Risk for the school site, as the site was planned at the time of this analysis, including mitigation measures, if any, meets the Individual Risk Criterion stated in the 2007 CDE Protocol, based on the information provided to me.

Printed Name	Signature	Position or Title
Kenneth Wilson, PG 3175		Principal Geologist

Notice: In the event that the Individual Risk Criterion could not be met, at the option of the LEA, CDE will still accept a report for review and consultation with the LEA.

CCR, Title 5, Pipeline Risk Analysis Report
Form 2 - Pipeline Risk Analysis Input Data

Date: April 20, 2007		
Local Educational Agency: Tulare County Office of Education		
Existing School Site Name: Existing School is Traver Joint Elementary School		
Existing School Current Population: Existing population is 228 students (Navigant, 2007)		
Product	*Designate by an "X"*	
Natural gas (NG)	☒	*KRCD CPP*
Crude oil	☐	
Gasoline	☐	
Liquefied natural gas (LNG)	☐	
Liquefied petroleum gas (LPG)	☐	
Natural gas liquids (NGL)	☐	
Other refined product (specify)	☐	
Other substance (specify)	☐	
Pipeline Location Attributes	*Units*	**Value**
Segment length	ft	2925
Closest approach to property line	ft	180
Closest approach to usable portion of the school site	ft	180
Land use by class location (49 CFR Part 192)	Class	3
Pipeline Attributes		
Diameter	inches	20
Maximum operating pressure	psig	700
Average operating pressure	psig	650 (Average max.)
Depth of burial	ft	Top 36-inches
Distance to nearest compressor (gas) or pump station (liquid)	ft	Unknown
Throughput		NA
Liquid (enter value, meter, etc.)	gpm	NA
Nearest block valve locations, upstream and downstream of segment of concern		Unknown
Above ground components within 1500-ft zone		None
Number		NA
Type		NA
Pipeline location on terrain gradient relative to school (Designate with an "X" by appropriate description)		
Flat		☒
Up gradient		☒
Down gradient		☐
"Convoluted"		☐

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 3 - Standard Protocol Calculation Summary

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
Basic Data Input				
	Baseline frequency per pipeline mile	F0, releases/ mile-year	1.2E-04	Historical or default release frequency from Table 4-3 or Appendix B.
	Segment length within 1500-ft buffer	SEG, Miles	2925	Determine from site maps, GIS, or other sources
	Nearest property line distance	R0, ft	180	Determine from maps
	Receptor location distance, if different than nearest property line	R(i), ft	180	Determine from maps
	Base release probability	P0	1.2E-04	$P0 = 1 - e^{(-F0 \times t)}$
	Probability adjustment factor	PAF	1	Default value selected by analyst
	Adjusted base probability	PA	1.2E-04	PA = P0 × PAF

Special Seismic Considerations

Please summarize and/or list below any adjustments made to the Protocol base risk analysis estimates and the special seismic conditions and studies upon which these adjustments were based. If adjustments were based upon special seismic conditions, the signature(s) and titles of those professionals involved are required. Attach additional pages if needed.

See Section 2 and Figure 3.

Signatures for Above, If Needed

Printed Name	Signature	Title
Kenneth Wilson, PG 3175		Principal Geologist

Protocol Basis Scenario Probabilities

	XSEG length, leak, ft:	Variable	Value	ALOHA Modeling Indicates
	Leak jet or pool fire	ft	33	For 1.0-inch hole
	Leak flash fire	ft	0	No explosion overpressure for leaks.

(Continued on next page)

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
	Leak gas or vapor explosion	ft	0	No explosion overpressure for rupture.
	Individual XSEG failure and release probabilities, leak, PA(LX):			
	Leak jet or pool fire	PA(LJF)	0	
	Leak flash fire	PA(LFF)	0	
	Leak gas or vapor explosion	PA(LEX)	0	
	XSEG length, rupture, ft:			
	Rupture jet or pool fire	ft	910	R(i) slightly different non-parallel pipe
	Rupture flash fire	ft	6835	R(i) slightly different non-parallel pipe
	Rupture gas or vapor explosion	ft	0	
	Individual XSEG failure and release probabilities, rupture, PA(RX):			
	Rupture jet or pool fire	PA(RJF)	2.7E-05	
	Rupture flash fire	PA(RFF)	1.4E-04	
	Rupture gas or vapor explosion	PA(REX)	0	

Insert Protocol default values or exceptions to the Protocol default values:				**(If values other than Protocol default values were used, indicate the value in the appropriate cell and indicate the data source.)**
	Probability of leak	PC(L)	0.8	Default: 0.8
	Probability of rupture	PC(R)	0.2	Default: 0.2
	Probability of leak ignition	PC(LIG)	0.3	Default: gas 0.3 (FEMA 1989); gasoline, 0,09; liquids other than gasoline (e.g., crude oil): 0.03
	Probability of rupture ignition	PC(RIG)	0.45	Default: gas 0.45 (FEMA 1989); gasoline: 0.09; liquids other than gasoline (e.g., crude oil): 0.03

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California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 3 - Standard Protocol Calculation Summary

(Continued from previous page)

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
Insert Protocol default values or exceptions to the Protocol default values:				**(If value other than default used, indicate value in appropriate column and indicate data source.)**
	Probability of fire on ignition	PC(FIG)	0.99	Default: gas 0.99 (FEMA 1989); liquid 0.95
	Probability of explosion on ignition	PC(EIG)	0.01	Default: gas 0.01; liquid 0.05
	Probability of flash fire	PC(FF)	0.01	Default: gas 0.01; liquid 0.05
	Probability of jet fire (gas pipelines) or pool fire (liquid pipelines)	PC(JF)	0.98	Default: gas = 0.98; liquid = 0.95
	Probability of occupancy	PC(OCC)	0.16	Default: 180 days per year, 8 hrs per day.
	Probability of outdoor exposure	PC(OUT)	0.25	Default: 2 hr outdoors during an 8-hour day onsite.
	Probability of leak jet/pool fire impact	PCI(LJF)	0.23	Determined from Table 4-7
	Probability of rupture jet/pool fire impact	PCI(RJF)	0.09	Determined from Table 4-7
	Probability of leak flash fire impact	PCI(LFF)	0.002	Determined from Table 4-7
	Probability of rupture flash fire impact	PCI(RFF)	0.001	Determined from Table 4-7
	Probability of leak explosion impact	PCI(LEX)	0.002	Determined from Table 4-7
	Probability of rupture explosion impact	PCI(REX)	0.001	Determined from Table 4-7
Individual Risk Summary				
	Leak jet fire IR	IR(LJF)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture jet fire IR	IR(RJF)	6.1E-08	2007 CDE protocol spreadsheet
	Leak flash fire IR	IR(LFF)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture flash fire IR	IR(RFF)	4.6E-09	2007 CDE protocol spreadsheet
	Leak explosion IR	IR(LEX)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture explosion IR	IR(REX)	0.0E+00	2007 CDE protocol spreadsheet
Total IR and IRC				
	Total Individual Risk	TIR	**7.8E-08**	2007 CDE protocol spreadsheet
	CDE Individual Risk Criterion	IRC	**1.0E-06**	
Check shaded boxes as follows:				
	If TIF / IRC > 1.0	☐		"Significant"
	If TIF / IRC < =1.0	☒		"Insignificant"
IR and Population Risk Indicators				
	IR Indicator	☒	**0.08**	2007 CDE protocol spreadsheet
	Population Risk Indicator	☒	**0.30**	2007 CDE protocol spreadsheet

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 4 - Alternative Calculations Summary

School Site: Traver Elementary School

Listing of Attached Alternative Documentation: No alternative calculations were made.

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 5 - Supplementary Documentation

School Site: Traver Elementary School

Listing of Attached Supplementary Documentation:

Traver Average TIR Index for Gas Release (All Viable Hazards)

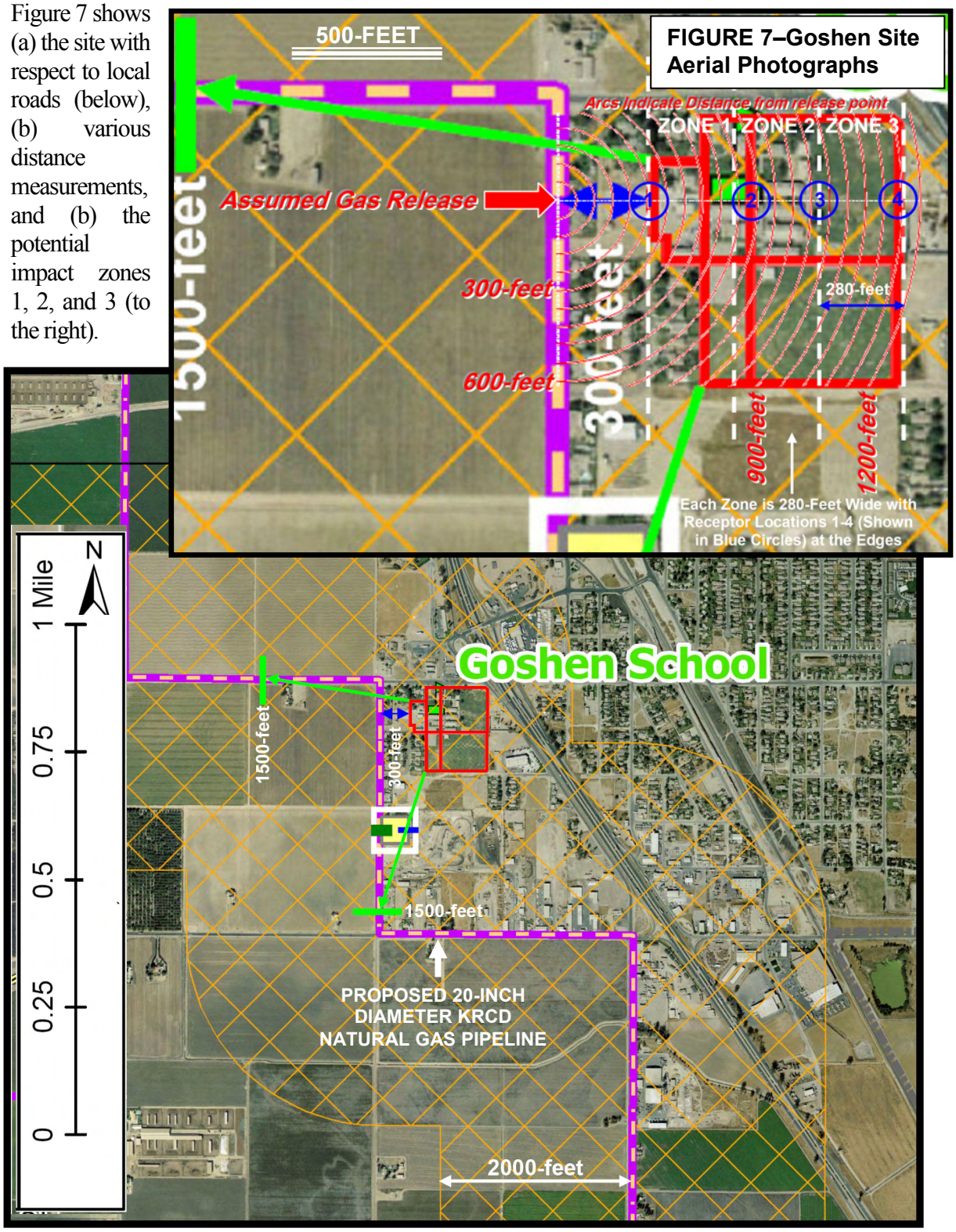
Zone Boundary	Boundary Distance from Pipeline (Feet)	TIR (Probability)
Begin Zone 1 (nearest property boundary)	300	7.80E-08
Begin zone 2	580	5.50E-09
Begin zone 3	860	5.40E-09
End Zone 3 (farthest property boundary)	1140	5.20E-09
	Average TIR	**2.35E-08**
	TIR Indicator Ratio	**0.30**

Traver Population Risk Indicator for Gas Release (All Viable Hazards)

Zone	Distance from Pipeline (Feet)		Zone Boundary Mortalities (All hazards in %)		Simple Average Zone Mortality (All hazards in %)	Population (In/Out = *Percentage* of indoor/outdoor area within a Zone and the number of indoor (30%)/ outdoor *Persons* within a Zone)				Zone Populations	Population Risk Indicators
						Percentage		*Persons*			
	Begin	End	Begin	End		In	Out	In	Out		
1	180	520	100.0%	0.0%	50.0%	12.5%	12.5%	40	17	17	8.6
2	520	860	0.0%	0.0%	0.0%	14.0%	21.0%	56	24	24	0.0
3	860	1200	0.0%	0.0%	0.0%	0.0%	40.0%	64	27	27	0.0
					Totals→	26.5%	73.5%	160	68	68	
Total Site Population→			**228**			**Total Population Risk Indicator→**					**9**

6. GOSHEN ELEMENTARY SCHOOL SITE

This subsection presents the Forms 1 through 5 required by the Stage 2 risk analysis protocol. Figure 7 shows (a) the site with respect to local roads (below), (b) various distance measurements, and (b) the potential impact zones 1, 2, and 3 (to the right).



Navigant Consulting (2007)

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 1 – Administrative, Summary, and Signature Form

Local Educational Agency	
Date	April 20, 2007
Local Educational Agency	Visalia Unified School District
Contact (First and Last Name)	Not Applicable
Telephone Number	Not Applicable
E-mail Address	Not Applicable
Street Address	Not Applicable
Department or Mail Drop	Not Applicable
City	Not Applicable
County	Not Applicable
Zip Code	Not Applicable
Existing School Campus Site	
Name (Site Identifier)	Goshen Elementary School
Location Description (Brief description of the property and its boundaries. Copy and attach a more detailed description as needed.)	6505 Avenue 308, Goshen, CA 93227 South of Avenue 308, west of Featherstone Road, north of Harvest Avenue, and east of Road 66 (36.3472 North and 119.4269 West).
Pipeline of Interest	
Operator / Owner	Future SCGC will operate and KRCD CPP will build
Product Transported	Natural Gas
Pipeline Diameter (inches)	20
Operating Pressure (psig)	Varies 450 to 700 psig; 650 psig used in the analysis.
Closest Approach to Property Line (or boundary between the usable and unusable portion of the site if the unusable portion faces the pipeline.) (ft)	300

Individual Risk Estimate Result						
Type of Analysis (Check One)	**Stage 1 →**	☐	**Stage 2 →**	☒	**Stage 3 →**	☐
Individual Risk Estimate Value	**6.6E-08**					
Individual Risk Criterion	**1.0E-06 (0.000001)**					
IR Significance (check one)	**Significant**	☐				
	Insignificant	☒				

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California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 1 – Administrative, Summary, and Signature Form
(Continued from previous page)

Population Risk Indicator Result	
Protocol Average IR	**1.99E-08**
IR Indicator Ratio (Average IR / Property Line IR)	**0.30**
Population Risk Indicator	**24**

Prevention and Mitigation Recommendations/Implementations (☐See Attached)
Prevention Measures: Possible Future Consideration
Mitigation Measures: Possible Future Consideration
Assumptions/Conclusions/Other Suggestions/Recommendations: (☐See attached sheets)
See Section 7

Certification and Signatures of Risk Analyst(s)

This analysis was conducted according to the 2007 CDE Protocol except as noted. All modifications within the Stage 2 framework, and Stage 3 analyses and exceptions to the data and processes established in the 2007 CDE Protocol, if any, were based upon my professional opinion and in a manner consistent with the standards of care and skill ordinarily exercised by professionals working on similar projects.

I certify that the estimated risk levels were derived based upon the 2007 CDE Protocol, unless otherwise noted, and that these levels demonstrate, within reasonable expectations of uncertainties for such estimates, that the estimated Individual Risk for the school site, as the site was planned at the time of this analysis, including mitigation measures, if any, meets the Individual Risk Criterion stated in the 2007 CDE Protocol, based on the information provided to me.

Printed Name	Signature	Position or Title
Kenneth Wilson, PG 3175		Principal Geologist

Notice: In the event that the Individual Risk Criterion could not be met, at the option of the LEA, CDE will still accept a report for review and consultation with the LEA.

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 2 - Pipeline Risk Analysis Input Data

Date: April 20, 2007		
Local Educational Agency: Visalia Unified School District		
Existing School Site Name: Existing School is Goshen Elementary School		
Existing School Current Population: Existing population is 490 students (Navigant, 2007)		
Product	*Designate by an "X"*	
Natural gas (NG)	☒	*KRCD CPP*
Crude oil	☐	
Gasoline	☐	
Liquefied natural gas (LNG)	☐	
Liquefied petroleum gas (LPG)	☐	
Natural gas liquids (NGL)	☐	
Other refined product (specify)	☐	
Other substance (specify)	☐	
Pipeline Location Attributes	*Units*	**Value**
Segment length	ft	3550
Closest approach to property line	ft	300
Closest approach to usable portion of the school site	ft	300
Land use by class location (49 CFR Part 192)	Class	3
Pipeline Attributes		
Diameter	inches	20
Maximum operating pressure	psig	700
Average operating pressure	psig	650 (Average max.)
Depth of burial	ft	Top 36-inches
Distance to nearest compressor (gas) or pump station (liquid)	ft	Unknown
Throughput		NA
Liquid (enter value, meter, etc.)	gpm	NA
Nearest block valve locations, upstream and downstream of segment of concern		Unknown
Above ground components within 1500-ft zone		None
Number		NA
Type		NA
Pipeline location on terrain gradient relative to school (Designate with an "X" by appropriate description)		
Flat		☒
Up gradient		☒
Down gradient		☐
"Convoluted"		☐

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 3 - Standard Protocol Calculation Summary

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
Basic Data Input				
	Baseline frequency per pipeline mile	F0, releases/ mile-year	1.2E-04	Historical or default release frequency from Table 4-3 or Appendix B.
	Segment length within 1500-ft buffer	SEG, Miles	3550	Determine from site maps, GIS, or other sources
	Nearest property line distance	R0, ft	300	Determine from maps
	Receptor location distance, if different than nearest property line	R(i), ft	300	Determine from maps
	Base release probability	P0	1.2E-04	$P0 = 1 - e^{(-F0 \times t)}$
	Probability adjustment factor	PAF	1	Default value selected by analyst
	Adjusted base probability	PA	1.2E-04	PA = P0 × PAF

Special Seismic Considerations

Please summarize and/or list below any adjustments made to the Protocol base risk analysis estimates and the special seismic conditions and studies upon which these adjustments were based. If adjustments were based upon special seismic conditions, the signature(s) and titles of those professionals involved are required. Attach additional pages if needed.

See Section 2 and Figure 3.

Signatures for Above, If Needed

Printed Name	Signature	Title
Kenneth Wilson, PG 3175		Principal Geologist

Protocol Basis Scenario Probabilities

	XSEG length, leak, ft:	Variable	Value	ALOHA Modeling Indicates
	Leak jet or pool fire	ft	33	For 1.0-inch hole
	Leak flash fire	ft	0	No explosion overpressure for leaks.

(Continued on next page)

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
	Leak gas or vapor explosion	ft	0	No explosion overpressure for rupture.
	Individual XSEG failure and release probabilities, leak, PA(LX):			
	Leak jet or pool fire	PA(LJF)	0	
	Leak flash fire	PA(LFF)	0	
	Leak gas or vapor explosion	PA(LEX)	0	
	XSEG length, rupture, ft:			
	Rupture jet or pool fire	ft	774	R(i) slightly different non-parallel pipe
	Rupture flash fire	ft	5737	R(i) slightly different non-parallel pipe
	Rupture gas or vapor explosion	ft	0	
	Individual XSEG failure and release probabilities, rupture, PA(RX):			
	Rupture jet or pool fire	PA(RJF)	2.7E-05	
	Rupture flash fire	PA(RFF)	1.4E-04	
	Rupture gas or vapor explosion	PA(REX)	0	

Insert Protocol default values or exceptions to the Protocol default values:				**(If values other than Protocol default values were used, indicate the value in the appropriate cell and indicate the data source.)**
	Probability of leak	PC(L)	0.8	Default: 0.8
	Probability of rupture	PC(R)	0.2	Default: 0.2
	Probability of leak ignition	PC(LIG)	0.3	Default: gas 0.3 (FEMA 1989); gasoline, 0,09; liquids other than gasoline (e.g., crude oil): 0.03
	Probability of rupture ignition	PC(RIG)	0.45	Default: gas 0.45 (FEMA 1989); gasoline: 0.09; liquids other than gasoline (e.g., crude oil): 0.03

(Continued on next page)

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Form 3 - Standard Protocol Calculation Summary

(Continued from previous page)

	Release Probability Calculations	Variable	Value	Data Source if Different from Protocol
Insert Protocol default values or exceptions to the Protocol default values:				**(If value other than default used, indicate value in appropriate column and indicate data source.)**
	Probability of fire on ignition	PC(FIG)	0.99	Default: gas 0.99 (FEMA 1989); liquid 0.95
	Probability of explosion on ignition	PC(EIG)	0.01	Default: gas 0.01; liquid 0.05
	Probability of flash fire	PC(FF)	0.01	Default: gas 0.01; liquid 0.05
	Probability of jet fire (gas pipelines) or pool fire (liquid pipelines)	PC(JF)	0.98	Default: gas = 0.98; liquid = 0.95
	Probability of occupancy	PC(OCC)	0.16	Default: 180 days per year, 8 hrs per day.
	Probability of outdoor exposure	PC(OUT)	0.25	Default: 2 hr outdoors during an 8-hour day onsite.
	Probability of leak jet/pool fire impact	PCI(LJF)	0.23	Determined from Table 4-7
	Probability of rupture jet/pool fire impact	PCI(RJF)	0.09	Determined from Table 4-7
	Probability of leak flash fire impact	PCI(LFF)	0.002	Determined from Table 4-7
	Probability of rupture flash fire impact	PCI(RFF)	0.001	Determined from Table 4-7
	Probability of leak explosion impact	PCI(LEX)	0.002	Determined from Table 4-7
	Probability of rupture explosion impact	PCI(REX)	0.001	Determined from Table 4-7
Individual Risk Summary				
	Leak jet fire IR	IR(LJF)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture jet fire IR	IR(RJF)	6.1E-08	2007 CDE protocol spreadsheet
	Leak flash fire IR	IR(LFF)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture flash fire IR	IR(RFF)	4.6E-09	2007 CDE protocol spreadsheet
	Leak explosion IR	IR(LEX)	0.0E+00	2007 CDE protocol spreadsheet
	Rupture explosion IR	IR(REX)	0.0E+00	2007 CDE protocol spreadsheet
Total IR and IRC				
	Total Individual Risk	TIR	**6.6E-08**	2007 CDE protocol spreadsheet
	CDE Individual Risk Criterion	IRC	**1.0E-06**	
Check shaded boxes as follows:				
	If TIF / IRC > 1.0	☐		"Significant"
	If TIF / IRC < =1.0	☒		"Insignificant"
IR and Population Risk Indicators				
	IR Indicator	☒	**0.07**	2007 CDE protocol spreadsheet
	Population Risk Indicator	☒	**0.30**	2007 CDE protocol spreadsheet

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Form 4 - Alternative Calculations Summary

School Site: Goshen Elementary School

Listing of Attached Alternative Documentation: No alternative calculations were made.

California Department of Education
CCR, Title 5, Pipeline Risk Analysis Report
Form 5 - Supplementary Documentation

School Site: Goshen Elementary School

Listing of Attached Supplementary Documentation:

Goshen Average TIR Index for Gas Release (All Viable Hazards)

Zone Boundary	Boundary Distance from Pipeline (Feet)	TIR (Probability)
Begin Zone 1 (nearest property boundary)	300	6.6E-08
Begin zone 2	580	4.60E-09
Begin zone 3	860	4.50E-09
End Zone 3 (farthest property boundary)	1140	4.30E-09
	Average TIR	**1.99E-08**
	TIR Indicator Ratio	**0.30**

Goshen Population Risk Indicator for Gas Release (All Viable Hazards)

Zone	Distance from Pipeline (Feet)		Zone Boundary Mortalities (All hazards in %)		Simple Average Zone Mortality (All hazards in %)	Population (In/Out = *Percentage* of indoor/outdoor area within a Zone and the number of indoor (30%)/ outdoor *Persons* within a Zone)				Zone Populations	Population Risk Indicators
						Percentage		*Persons*			
	Begin	End	Begin	End		In	Out	In	Out		
1	300	580	81.0%	0.0%	40.5%	35%	5%	137	59	59	23.8
2	580	860	0.0%	0.0%	0.0%	20%	10%	103	44	44	0.0
3	860	1140	0.0%	0.0%	0.0%	0%	30%	103	44	44	0.0
					Totals→	55%	45%	343	147	147	
Total Site Population→			**490**			**Total Population Risk Indicator→**					**24**

7. ASSUMPTIONS

All Sites

1. Because a 20-inch diameter pipeline was not part of the 2007 CDE protocol, an interpolation was made for each site for the Heat Radiation (5000 BTU/hr-ft2) distance value (determined to be 490-feet representing 1% mortality) from Figures 4-11 and 4-12.

2. The 2007 CDE protocol indicates in the Population Risk Indicator example that the population can be evenly distributed across the impact zones. In this case as rough visual estimate was made of the percentage of outdoor area available for playfields or assembly in each zone and that value was used to distribute the 30 percent outdoor population.

Indianola ES

1. The analysis did not include the KRCD power plant, which has a site center located approximately 2600 feet to the east-northeast of the school site.

2. Both of the "square" parcels comprising the school site were considered to be potentially usable for future school activities.

Kings River ES

1. The pipeline-to-site distance may be somewhat less than the 50-feet assumed, however the 2007 CDE protocol model is not applied for smaller distances.

2. No analysis was made of the potential for subsurface gas to escape from the pipeline and migrate toward the school (one building is within about 80 feet of the pipeline) in underground geologic formations or underground man-made pathways (e.g., utility trenches, sewer pipes, storm drains, etc.). The probability of such an occurrence is likely not much greater, or no more, than the 1×10^{-6} individual risk threshold.

Traver JES

1. Because of the unusual pipeline and site boundary configurations (diverging acute angles rather than parallel lines), the nearest point to the site was chosen as the edge of Zone 1, rather than using the center of an adjacent property boundary. Therefore, XSEG(x) was measured and "input" to the risk analysis spreadsheet to achieve a more accurate value.

2. No analysis was made of the potential for subsurface gas to escape from the pipeline and migrate toward the school (one building is within about 80 feet of the pipeline) in underground geologic formations or underground man-made pathways (e.g., utility trenches, sewer pipes, storm drains, etc.). The probability of such an occurrence is likely not much greater, or no more, than the 1×10^{-6} individual risk threshold.

Goshen ES

1. Because of the pipeline/site boundary configuration is not a set of two parallel lines, the center point of the nearest adjacent property boundary to the site was chosen on the edge of Zone 1, however the XSEG(x) for the pipeline segments perpendicular to

this boundary were measured and "input" to the risk analysis spreadsheet to achieve a more accurate value.

8. CLOSURE

This analysis was conducted according to the 2007 CDE Protocol except as noted. This includes the full implications of the URS Disclaimer in the 2007 CDE protocol (Page ii of Volume 1 – User's Manual). In addition, aerial photographs and the scales on the documents provided by Navigant were used to determine lengths and distances used in this analysis. Inconsistencies (if any) between the 2002 CDE draft protocol and the 2007 CDE protocol are the sole responsibility of the authors of these documents. Final pipeline designs and decisions to adopt recommendations in this report are the responsibilities of others. We make no warranties either expressed or implied.

9. REFERENCES

CDE, 2007, California Department of Education--Guidance Protocol for School Site Pipeline Risk Analysis—prepared by URS, March 2007.

CGS, 2002, California Geological Survey Fault Map of California (source for Figure 3).

MapQuest, 2007, source for Figure 1.

Navigant Consulting, 2007, Amy Cuellar, KRCD natural gas pipeline aerial photographs (basis for pipeline location, site boundaries, and scales; sources for Figures 4 through 7), topographic maps, and pipeline information (source for Figure 2), January through April 2007.

USGS, 1969-1981, U. S. Geological Survey Selma (1978/1981), Reedley (19778/1981), Traver (1977), and Goshen (1969) 7.5-minute topographic quadrangle maps, scale 1" = 2000'.

If you have any questions about this report, please contact the undersigned at 626 791-1589, or at wilsongeo@earthlink.net.

Sincerely,
WILSON GEOSCIENCES INC.

Kenneth Wilson
Principal Geologist
P.G. #3175, C.E.G. #928

Appendix 8.5-1

Kings River Conservation District
Community Power Plant Project
Effluent and Groundwater Quality

				Groundwater							Effluent	
		Primary	Secondary	Power Plant	Parlier WWTP	Parlier WWTP	Parlier WWTP	Parlier WWTP	Parlier WWTP	Parlier WWTP	Parlier WWTP	Sanger WWTP
Constituent	Unit	MCL	MCL	Existing Irrigation Well	Monitoring Well No. 4	Monitoring Well No. 6	Monitoring Well No. 7	Monitoring Well No. 8	Monitoring Well No. 9	Monitoring Well No. 10	Effluent at Lagoon No. 3	Domestic Effluent
Inorganic												
Alkalinity	mg/L			240							190	89
Aluminum	mg/L	0.2	0.2	0.18							0.56	0.49
Ammonia	mg/L			ND							22	ND
Antimony	µg/L	6		ND							ND	ND
Arsenic	µg/L	10		ND							2.5	ND
Barium	µg/L	1000		120							ND	0.052
Beryllium	µg/L	4		ND							ND	ND
Bicarbonate	mg/L			240	320	130	250	81	250	87	190	89
Cadmium	µg/L	5		ND							ND	ND
Calcium	mg/L			64	120	39	120	34	66	30	22	24
Carbonate	mg/L			ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloride	mg/L		250 / 500	45	61	48	17	49	48	42	45	64
Chromium	µg/L	50		ND							ND	ND
Copper	µg/L	1,300	1,000	ND							76	100
Cyanide	µg/L	150		ND							ND	ND
Electrical Conductivity	µmhos			760	1,100	660	970	660	760	590	610	600
Fluoride	mg/L	0.2		ND	ND	ND	ND	ND	0.2	ND	ND	0.2
Hardness	mg/L			230							65	130
Hydroxide	mg/L			ND							ND	ND
Iron	mg/L		0.3	0.29	2.2	ND	ND	ND	ND	ND	0.27	0.3
Lead	µg/L	150		ND							ND	ND
Magnesium	mg/L			18	32	17	33	10	18	12	2.5	17
Manganese	mg/L		0.05	ND	0.07	ND	ND	ND	0.58	ND	0.013	0.06
MBAS, calc'd as LAS	mg/L		0.5	ND							ND	0.062
Mercury	µg/L	2		ND							ND	ND
Molybdenum	µg/L			ND							17	11
Nickel	µg/L	100		ND							ND	ND
Nitrate (as NO_3)	mg/L	10		67							ND	86.0
Nitrite (as N)	mg/L	1		ND	20	16	22	27	ND	22	0.1	0.3
Nitrogen - Total (IC)	mg/L	10										
Nitrogen - Total Kjeldahl	mg/L											
pH				8.2	7.9	7.5	8	7.3	8	7.4	7.8	7.6
Phosphorous	mg/L			ND							5	4
Potassium	mg/L			6.3	6.2	3.6	5.3	78	3.8	3	9.2	12
Selenium	µg/L	50		ND							ND	ND
Silver	mg/L		0.1	ND							ND	ND
Sodium	mg/L			76	80	73	51	78	75	69	63	71
Sulfate	mg/L		250 / 500	43	65	37	100	41	37	30	33	44
Thallium	µg/L	2		ND							ND	ND
Total Dissolved Solids	mg/L		500 / 1000	490							300	420
Total Organic Carbon	mg/L											
Total Phosphorus					ND	ND	ND	ND	ND	ND		
Total Suspended Solids	mg/L			8								
Total Volatile Dissolved	mg/L											
Turbidity	NTU		5	2							34	4.6
Zinc	µg/L		5000	ND							0.065	0.13
Organic												
Bromodichloromethane	µg/L											23
Bromoform	µg/L											ND
Chloroform	µg/L											97
Dibromochloromethane	µg/L											3.7
Total Trihalomethane	µg/L											120
Fecal Coliform	MPN/100ml											<2
Total Coliform	MPN/100ml											<2
E.C. (umohs/cm)	µmhos										628	
D.O. (mg/L)	mg/L										3.1	
B.O.D. (mg/L)	mg/L										37	10
Total S.S. (mg/L)	mg/L										41.4	12
Settable Solids (mg/L)	mg/L										0	
pH											8.2	

Constituent Concentration Exceeds Primary MCL

Constituent Concentration Exceeds Secondary MCL

Notes:

Parlier Power Plant Site Existing Irrigation Well

1 - Samples taken on 10-10-2006.

2 - Samples tested by BSK Analytical Laboratories for KRCD.

Parlier Monitoring Well Water Quality

1 - Data shown for samples collected 3-23-2006.
2 - Samples collected and tested quarterly by City of Parlier
3 - No units given on water quality data sheets

Parlier WWTP Effluent at Lagoon 3 Water Quality

1 - Inorganic data shown for samples collected 8-18-06, tested by BSK Analytical Laboratories.
2 - Organic constituent data derived from averages of samples collected and analyzed by City of Parlier for the months of January 2005 through August 2005

Sanger Domestic Effluent Water Quality

1 - Data shown for samples collected 8-17-06
2 - Samples tested by BSK Analytical Laboratories for KRCD.
3 - BOD and TSS based on 7 year average from 1999-2005

MCL = Maximum contaminant level for potable water. These values are provided for comparison purposes only. These standards do not necessarily need to be met to use the water for process uses, fire protection, and landscape irrigation.