

APPENDIX H

Comparisons of Alternative Mitigation Plans

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I. Introduction

Several commentors submitted various alternative mitigation proposals and/or requested comparisons with other mitigation measures. Many specific questions and issues are addressed individually in the Responsiveness Summary (RS). This appendix provides some additional response to issues raised which are difficult to properly address in the format of the RS.

Alternative mitigation measures submitted were carefully evaluated and, where appropriate, precipitated a revision of the Longhorn Mitigation Plan (LMP); either as an added new measure or as a modification to an existing measure. However, some proposed mitigation measures were not deemed appropriate. These are discussed in this appendix.

The objective of the LMP is to specify a set of mitigation measures that are in proportion to the potential consequences. Since there are a multitude of mitigation measures that could be included in the plan, choices are required. This requires consideration not only of the measure's effectiveness in reducing risk, but also how finite resources are best spent in achieving an overall level of safety. It is not reasonable to require every conceivable mitigation measure for all sections of the pipeline.

In many cases, disparities between specific mitigations are seen when comparing alternative plans. These disparities must be viewed in the context of the overall mitigation plan, since it is the aggregate of the individual measures that will determine the plan effectiveness. Consequently, the answer to the question, "why not include this mitigation in the LMP?" will, in some cases, be simply that resources are better spent in implementing the current LMP measures. In other cases, the answer will be that the current plan is seen to be sufficient without the addition. Where more justification for LMP choices is appropriate, a discussion is provided in the RS or in this appendix.

II. Comparison between Olympic Agreement (Olympic Pipe Line) and LMP

Although the LMP and the Olympic Pipe Line Company's safety agreement were developed independently in the last half of 1999, there are many parallels. Both have requirements that exceed current federal regulations. The Longhorn Mitigation Commitments (LMC) seem more stringent in several instances, while in other cases, the Olympic measures appear to be more stringent. The Olympic agreement focuses on pre-startup activities, while the Longhorn plan goes further to include on-going operations and maintenance activities. The attached table compares specifics of the two plans.

Without additional detailed study, it is difficult to precisely compare the overall impact of the two plans because the situations are not exactly equivalent. In aggregate, however, the LMCs appear to provide more overall risk reduction. While this is arguable, the statement is based on the following aspects of the LMP that are not seen in the Olympic agreement:

- Many aspects of third-party damage (a leading cause of pipeline failure) are addressed as well as additional failure modes (last 11 items in the attached table);

- Very challenging leak detection capabilities are being mandated;
- Significant length of new pipe is being installed even though existing pipe has not failed; and
- A special limitation of allowable surge pressure is imposed.

The Olympic Pipe Line Safety Agreement does, however, emphasize certain elements compared to the LMP:

- More oversight and detailed review by city officials (in addition to DOT oversight). Note that this is likely made possible by city ownership of property through which Olympic Pipe Line traverses.
- Possible limitations on pump pressurization capabilities.

These are noteworthy issues, but they are not thought to offset the many additional requirements of the LMP. The following table compares specifics of the two plans.

Discussion of Individual Aspects

As is evident from the table and the preceding discussion, the LMP is thought to exceed the Olympic agreement in many individual mitigation aspects and hence, also in aggregate. For individual aspects of the Olympic agreement that seem to exceed individual aspects of the LMP, some discussion is offered below:

Oversight and Review

Many aspects of the Olympic agreement call for oversight and review of Olympic activities by city personnel, in addition to DOT oversight. The LMP relies on DOT oversight. This is thought to be sufficient because of the detailed provisions and enforceability of the LMP.

Safety Systems

The Olympic agreement implies that pumps may have their impellers modified so that pipeline pressures cannot exceed 110 percent MOP. It is not clear if this included surge pressures. The LMP limits surge potential in critical areas to 100 percent MOP, but does not address pump capacities. The surge limitation, coupled with normal safety systems around all pumps, is thought to best address potential overpressure scenarios. An additional requirement to restrict pump impellers might have a significant impact on Longhorn's ability to transport product without a commensurate increase in public safety.

Startup Process

The Olympic agreement specifies several details of the Olympic startup process. The LMP specifies no special startup process beyond what Longhorn's operator, experienced in pipeline startups, normally utilizes. The startup procedures and actual process are subject to audit by DOT.

Topic	Discussion	Longhorn Stringency Compared to Olympic	Basis of Comparison Judgement
Pipe Replacement	More pipe replacement in Longhorn plan. Only damaged pipe (perhaps only 20 ft) to be replaced in the Olympic agreement, with replacement pipe of safety factor between 0.4 and 0.6, and concrete slab for additional protection specified. In the LMP, 19 miles of new pipe with 0.5 safety factor specified, with increased burial depth to 5 ft (or equivalent) and protective slab in some areas.	more	More miles replaced
Leak detection	More leak detection sensitivity specified in the LMP.	more	Tight specs; applicable span defined
Leak detection	Leak detection independent of SCADA specified in Olympic agreement. This is implied in the LMP since leak detection specs require near-perfect SCADA availability	equal	
Hydrotesting	Hydrostatic tests seem to be comparable (need more info to be exact), but the LMP allows lower test pressure for Tier 1 areas, and may be lower in other areas (90 percent SMYS vs. 1.38, perhaps, need more info). The Olympic agreement might therefore require somewhat higher test pressures, but only 10 miles (across city property) to be tested.	Unclear	More pipe tested, but less test pressure
Startup process	The Olympic agreement specifies startup process in stages, with many specifics mandated. In the LMP, auditing agency is to approve startup plans.	less	Olympic agreement has both city and DOT oversight and approvals
Independent audits	Independent safety audit specified in Olympic agreement after startup. In the LMP, independent audit done in EA.	equal	
Valve study	Additional valves and valve study specified in Olympic agreement. Valve study and possible valve additions (dependent on study) specified in the LMP.	equal	The LMP might require more valves, pending study results
Surge	The LMP requires that surges be limited to 100 percent of MOP in Tier 2 and 3 (110 percent elsewhere). Olympic agreement allows surges up to 110 percent MOP (consistent with DOT regs) as measured at Ferndale station.	more	
Surge	The Olympic agreement requires a field test to verify surge study calculations. The LMP only requires the study.	less	
Oversight	The Olympic agreement requires many pre-approvals by city of specific operator plans and actions. These are in addition to DOT oversight. The LMP relies on auditing agency for oversight.	NA	This is already considered in comparing specific measures.
Temporary pressure reduction	Both require reduced pressures until internal inspection, but the LMP requires 0.88 and the Olympic agreement requires 0.80 times MOP.	less	

Topic	Discussion	Longhorn Stringency Compared to Olympic	Basis of Comparison Judgement
Internal inspection	Internal inspection in the LMP specified within 3 months; in Olympic agreement, "as soon after startup as tools are available." In the Olympic agreement, city is to be invited to excavations/inspections related to internal inspections.	equal	Olympic agreement has more oversight by city
Safety systems	Olympic agreement might ("if necessary") require modifications to pumps so that overpressure is not possible. This is in addition to normal safety systems. In the LMP, reliance is on safety systems to prevent overpressure.	less	If pump restrictions are mandated
Valve testing	Olympic agreement requires testing of mainline valves. No such requirement in the LMP (beyond normal DOT valve test requirements).	less	
SCADA	SCADA system diagnostics and full report specified in Olympic agreement. In the LMP, only a SCADA overview was done in the EA study, but SCADA performance is mandated if leak detection system is to be SCADA-based.	less	
Land use / regulations	Olympic agreement has many recommendations dealing with issues such as regulatory and land use issues. None are mandated at this time.	NA	
Depth of cover	Correction and enhancement of cover depths	more	Requirements specified in the LMP.
Patrolling	Increased patrols	more	Requirements specified in the LMP.
CIS	Additional close interval inspections for corrosion control	more	Requirements specified in the LMP.
ROW encroachments	Removal of ROW encroachments	more	Requirements specified in the LMP.
ROW clearing	ROW clearing	more	Requirements specified in the LMP.
Emergency response	Enhanced emergency response capabilities	more	Requirements specified in the LMP.
Public education	Increased public education	more	Requirements specified in the LMP.
Water quality testing	Perform strategic water quality testing	more	Requirements specified in the LMP.
SCC	Conduct studies for stress corrosion cracking	more	Requirements specified in the LMP.

Topic	Discussion	Longhorn Stringency Compared to Olympic	Basis of Comparison Judgement
Earth movements	Conduct earth movement study (including seismic, flood, scour, landslide, settlement, etc.)	more	Requirements specified in the LMP.
Root cause analysis	Conduct root cause analyses of previous incidents and repairs.	more	Requirements specified in the LMP.

Notes to table:

1. This table is based on Jim Hall's (NTSB chairman) testimony of October 27, 1999 (available on NTSB internet site) and Bellingham, Washington documents regarding agreement with Olympic Pipe Line (from Bellingham internet site, downloaded January 2000).
2. Measures listed in the table are not equally important as risk-reduction measures. The EA relative risk model or another comparative risk assessment model can best determine equivalencies between the two situations. However, a preliminary overall comparison is offered in the text preceding the table.

Surge

The LMP has more restrictions on allowable surges, but Olympic specifies a field test within 45 days after pressure levels reach 80 percent of MOP, to verify surge calculations. This is not a requirement for Longhorn since calculations are thought to be sufficiently accurate that such a field test is not warranted. DOT auditors have the discretion to require more verification of calculations if deemed appropriate.

Valve Testing

Both the Olympic agreement and the LMP specify a study to determine optimum placement of block valves and check valves. The Olympic agreement also requires special testing of two remotely operated valves prior to startup with the results reported to the city. The LMP relies upon standard six-month valve operation and maintenance inspections per current regulatory requirements.

Complete SCADA Analysis and Report

The LMP specifies leak detection capabilities and Longhorn has chosen to base their leak detection system on their SCADA system to a large extent. Consequently, the Longhorn SCADA system must perform with very high reliability to meet the leak detection specifications. As part of enforcing the leak detection specifications, DOT will verify SCADA performance. An independent study of the SCADA is not thought to be necessary since its actual performance, may be demonstrated to the DOT during audits, ensures an adequate system.

Temporary Pressure Limitation

The Olympic agreement specifies a pressure limit of 80 percent of MOP until inline inspections (ILI) and repairs are complete. LMP specifies a limit of 88 percent of MOP until the ILI and repairs are completed. The LMP's 88 percent is based on maintaining a 1.25 ratio between test pressure and operating pressure pending the ILI. Since portions of the system are tested to 1.1 times MOP, the 88 percent MOP limit preserves the 1.25 ratio. The rationale for Olympic's 80 percent MOP limit is not known.

III. LCRA Proposed Changes to LMP

LCRA has proposed specific changes to certain LMP mitigation measures during the public comment period. The proposed changes are shown in abbreviated form in column two of the following table. The full proposal can be seen in the Public Reading Room. Column three of this table has some brief summary responses to the proposed changes. More discussion of certain proposed changes is provided following the table.

Mitigation measure	LCRA proposed change	Comments
1. Hydrotesting	<ol style="list-style-type: none"> 1. Test entire length through Colorado watershed. 2. 5 year min. re-test or extended by Longhorn Public Partnership Team 	<ol style="list-style-type: none"> 1. 90 percent SMYS test will be done in area defined as Colorado watershed (MP 120 - 149 and 152 - 155) 2. ORA sets re-test and ILI schedule in current plan 3. Other provisions are met, per the LMP
2. Hydro "proof" test	Comment that this is not needed in Colorado. River watershed if proposed changes to mitigation 1 are done.	
3. Pipe replacement over Edwards Aquifer	Expand to cover 4 sensitive areas; means replacing 154 miles with new, higher safety factor pipe.	<ol style="list-style-type: none"> 1. More miles of new pipe eliminates age-related concerns and new safety factor improves "stoutness;" but tremendous cost and some disruption during installation. 2. Other provisions (cover and design factor) are already met in proposed replacement segment.
4. CP work	Cross check with ILI	No real changes apparent
5. Lower/replace at 12 locations	Below grade crossing at Marble Creek; 5-ft min. cover	<ol style="list-style-type: none"> 1. 11 of the 12 sites will be replaced and have 5-ft minimum cover; 2. Improved above-grade design for Marble Creek is in LMP; either design is acceptable; above-grade has different risk issues (loadings, support, atmospheric corrosion, vandalism, etc.).
6. Remove stopple fittings	Comment that this is no longer needed if other proposed changes are done (new pipe).	
7. Excavations based on previous ILI	None	

Mitigation measure	LCRA proposed change	Comments
8. Rabb's Creek and dent investigations	"Work at MP 239.9 and 266.6 is no longer applicable" if other measures done (pipe replacement)	
9. Surge and MASP issues	<ol style="list-style-type: none"> 1. "Re-examination and re-design of overpressure protection system." 2. Pump restrictions 3. Longhorn Public Partnership Team approval for future surge analyses 	<ol style="list-style-type: none"> 1. A more thorough examination of the overpressure protection system is possible but a "re-design" would be needed only if deficiencies are identified. 2. A restricted pump impeller size would also restrict flowrates and might not eliminate surges.
10, 11, 12. Internal Inspections	<ol style="list-style-type: none"> 1. Pending ILI, restrict pressures to 80 percent of MOP. 2. Longhorn Public Partnership Team review 	88 percent of MOP pressure limitation is currently in plan
13. Enhanced leak detection	<ol style="list-style-type: none"> 1. Redundant, independent secondary system for catastrophic leak detection 2. Longhorn Public Partnership Team oversight 3. If Tier 3 system is effective, then install at other critical zones (154 miles) 	Leak detection capabilities mandated by LMP require almost uninterrupted SCADA availability. Therefore, ability to get high reliability must be demonstrated, negating benefits of a redundant system.
14. CIS for corrosion control	Cross check with ILI	No real changes apparent
15. Span calculations; replace 671 ft of Grade B pipe	<ol style="list-style-type: none"> 1. ""Revise to reflect other parts of mitigation plan changes."" 2. Longhorn Public Partnership Team concurrence 	We assume that this means that proposed pipe replacement and other measures obviate the need for this.
16. Remove encroachments	Comments on enforcement	Insubstantial additions to existing mitigation
17. ROW clearing	None	

Mitigation measure	LCRA proposed change	Comments
18. Inspect, repair 26 locations from previous assessments	<ol style="list-style-type: none"> 1. 5-ft min. cover in 4 critical zones 2. On-going depth cover survey 3. 3-ft min everywhere 4. Longhorn Public Partnership Team approvals 	<ol style="list-style-type: none"> 1. LCRA adds much more length of pipe (154 miles) to the 5-ft depth-of-cover requirement. 2. LPSIP proposes risk mgmt approach to on-going survey and remediation efforts instead of blanket requirement.
19. Studies for earth movements, SCC, root cause analyses	<ol style="list-style-type: none"> 1. Longhorn Public Partnership Team review 2. Include corrosive and expansive soils 3. Special stream crossing actions 	<ol style="list-style-type: none"> 1. Stream measures must be evaluated on case-by-case basis. 2. Expansive soils should already be covered by current plan 3. Corrosive soils should be part of corrosion control system.
20. Patrol frequency	<ol style="list-style-type: none"> 1. Increase frequency in 4 critical zones 2. Use vapor detection sensors in weekly ground patrol 	<ol style="list-style-type: none"> 1. Adds more miles to high-frequency patrol. 2. Not sure of effectiveness of vapor sensors in this application (normally used in gas pipelines).
21. Increase frequency of pump station inspections in Tier 2 and Tier 3 areas; use remote cameras	Increase frequency at stations in 4 critical areas	Impact depends on how many more stations covered under LCRA 4 critical sites versus current Tier 2 and Tier 3 designations.
22. Valve study at water crossings; system changes to be made in 6 months	<ol style="list-style-type: none"> 1. Do study before startup 2. Longhorn Public Partnership Team oversight 3. Include populated areas and schools, etc. in study 4. Include check valves and remote operated valves 	<ol style="list-style-type: none"> 1. Current Longhorn plan does not mention check valves or remote operation, but that could be inferred to be part of study. 2. Current plan very limited to specific river and stream crossings.

Mitigation measure	LCRA proposed change	Comments
23. Response center to facilitate 2 hour response to Tier 3 areas	<ol style="list-style-type: none"> 1. Apply to all 4 critical areas 2. Longhorn Public Partnership Team oversight 3. Full-scale and table-top drills 4. Training requirements 	<ol style="list-style-type: none"> 1. Might expand coverage area, but not certain. 2. LCRA additions implied in current plan.
24. Revise facility response plan for firefighting outside metropolitan areas.	Details added regarding: <ol style="list-style-type: none"> 1. Training 2. Response 3. Coordination 	LCRA additions might already be implied in current plan
25. Enhanced public education	None	
26. Revise facility response plan for more planning for high population or sensitive areas	Facility list (schools, day cares, etc) to be approved by Longhorn Public Partnership Team	
27. Secondary containment around tanks per API 650.	Secondary containment around all pump stations of sufficient volume to hold reasonably possible spill sizes.	Adds pump stations instead of just tanks (all pump stations might not have tanks).
28. Revise facility response plan for consistency with government plans	None	
29. Water quality monitoring	<ol style="list-style-type: none"> 1. Tie in with measure 13. 2. LCRA coordination and approval of monitoring scheme 3. Monitor until alternate leak detection capabilities are proven. 	<ol style="list-style-type: none"> 1. Current plan not very specific about timing or duration. 2. LCRA sees this as a way to find very small leaks, at least temporarily.

Mitigation measure	LCRA proposed change	Comments
30. Contingency plans for alternate water supplies	<ol style="list-style-type: none"> 1. Must also consider private use wells. 2. Adds at least another 10 public drinking water supplies. 3. Address non-drinking water uses 4. Address financial assurances. 	
31. New surge study prior to any pertinent changes; environmental analyses from new pump stations	<ol style="list-style-type: none"> 1. Longhorn Public Partnership Team approvals 2. Supplemental environmental assessments subject to public comment 	Perhaps some risk reduction from third-party review of study.
32. Semi-annual pipe-to-soil corrosion surveys in Tier 2 and Tier 3 areas.	Cross check with ILI	No real changes apparent
33. Barton Springs Salamander issues; other conservation measures for T&E species.	None	
34. Eliminate surge allowance in Tier 3 areas	Also eliminate the surge allowance in 4 critical zones	Critical zones might already be covered by current requirements
NEW #1	Conduct a study of ground water flow characteristics of the Colorado River Alluvial Aquifer	LMC 14
NEW #2	<ol style="list-style-type: none"> 1. Routine CIS per NACE; 2. Annual frequency initially 3. Frequency changed with Longhorn Public Partnership Team approval. 	<ol style="list-style-type: none"> 1. Current mitigation #14 calls for CIS in Tier 3 and areas not covered in '98 survey. 2. Annual CIS in Tier 3 areas. 3. LPSIP calls for risk mgmt approach to on-going CIS frequency for Tier 1 and Tier 2.

Discussion

Within the specific changes proposed, two overall issues arise:

1. Establishment of Longhorn Public Partnership Team to oversee and approve most of the mitigations.
2. Four sensitive zones should be treated as requiring additional mitigation measures above those stipulated in the draft EA:
 - Colorado River zone;
 - Austin area;
 - Lake Travis contributing zone; and
 - Lake LBJ contributing zone.

These add up to be approximately 154 miles.

While the establishment of an oversight team is something that Longhorn may elect to do, such a team is not thought to be essential to the enforcement of an effective mitigation plan. The establishment of Tier 3 locations is well described in the EA. The expansion of current Tier 3 designated areas is not warranted).

Selected proposed changes from those submitted are discussed further below:

3. Pipe replacement over Edwards Aquifer
The proposal is to expand the pipe replacement to cover approximately 154 miles. The safety advantage of new pipe is mainly due to the elimination of integrity concerns such as past corrosion, crack growth, and external force damages. These integrity concerns can also be eliminated through thorough testing and inspection, as specified in the LMP. Therefore, the same advantages are obtained without the considerable expense and disruptions caused by long stretches of pipe replacement. The higher safety factor proposed does reduce risk, and the specified replacement pipe will have a lower calculated probability of failure. However, continuing this safety factor for additional miles is not thought to produce enough benefits to offset the high associated costs and construction impacts.
9. Surge and MASP issues
The LMP limits surge potential in critical areas to 100 percent MOP. This requirement, coupled with normal safety systems around all pumps, is thought to best address potential overpressure scenarios. Longhorn has also committed to install bypass pressure relief valves at the existing block valves located at the Brazos, Colorado, Pedernales and Llano rivers. These bypass valves will limit the surge pressure to MOP in areas designated as sensitive and hypersensitive. An additional requirement to restrict pump impellers, as proposed by commentor, might not reduce surge pressures and might have a significant impact on Longhorn's ability to transport product without a commensurate increase in public safety. Future surge analyses are triggered by a "management of change" process described in the LMP and are subject to review by DOT.

13. Enhanced leak detection

Leak detection capabilities mandated by the LMP require almost uninterrupted SCADA availability (depending on auditing agency interpretation). Therefore, the ability to get very high SCADA reliability must be demonstrated, effectively negating the benefits of a redundant system as proposed. Local pump safety switches are redundant to the SCADA system and provide another level of safety against large spills. Expanding the special, low-volume leak detection cable system beyond the three miles specified in the LMP, is not thought to be an appropriate response. The larger volume spills are detected by other means and would not be appreciably enhanced by the leak detection cable.

18. Inspect and repair 26 locations from previous assessments

The proposed change to this mitigation measure is to expand the specified 5 ft of cover (for 26 locations as detailed in the LMP) to include approximately 154 miles of pipe. This additional depth of cover is not thought to produce enough risk reduction benefits to offset the considerable costs and disruptions associated with such an effort.

20. Patrol frequency

The proposal is to increase inspection frequency of patrols throughout the four critical zones identified in LMC 3 (approximately 154 miles) to every 2.5 days and to include vapor detection sensor surveys at least weekly. For practical reasons, the four critical zones will be patrolled at the higher frequency since the hypersensitive locations prompting this frequency are scattered throughout the zones. Vapor detection effectiveness has not been verified for the type of products transported in this project, and hence is not specified.

IV. Additional Proposals by Commentors

One commentor submitted 35 pages of documents regarding the LMP. There are some inconsistencies in the submitted document, but the commentor appears to be summarizing criticisms of the proposed LMP by offering four alternative sets of mitigation measures. The four alternatives are equivalent to each other in most aspects, but differ primarily in the degree of replacement pipe recommended. The four can be described as follows:

- Pipeline re-route around city of Austin;
- Replace existing pipe through the city and 5 miles beyond city limits with double-walled pipe;
- Replace existing pipe through city and 5 miles beyond city limits; and
- Retain existing pipe.

These are arranged in order of the commentor's priority, with the first alternative suggested as the highest priority. Details of each alternative are adjusted (presumably on some risk basis) so that lower-ranking alternatives receive a higher level of protective actions, presumably to offset higher perceived risks.

This risk-based approach is very similar to the EA's methodology and indeed many requirements overlap. In some cases, the proposed alternatives suggest a higher level of mitigation. Examples include:

- More pipe replacement;
- Independent safety audit and oversight by the City of Austin;
- Use of double-walled pipe (in one alternative); and
- Control center simulator for training purposes.

In other cases, the proposed LMP requires more, including:

- Limitations to allowable surges;
- Use of 0.5 safety factor (double-strength) for some new pipe;
- Increased patrols; and
- Enhanced public education.

In many cases, there appear to be differences that can be easily remedied with clarifications. For instance, the commentor frequently states that pipe should be hydrostatically tested to at least 90 percent of SMYS. Page 14 of the LMP (draft EA Volume 2, Chapter 9 Appendices) clearly states that all Tier 2 and 3 areas will be tested to no less than 90 percent of SMYS. Additional challenges have to do with lack of design details and specifications in the draft EA. When not specifically tied to a recognized standard, the requirements of the LMP are subject to the standards and approvals of the auditing agency, DOT. This provides a mechanism to ensure that common industry practices, at a minimum, will govern design specifications.

Aspects of commentor's proposals which appear to have the most merit are shown below along with responses. These proposals are being paraphrased, based on interpretation of the intent of the comment and in light of currently proposed requirements:

- LMC 8: Ensure that all dents within the city boundaries (and any other Tier 3 area) are investigated, even if such dents were not deemed to be "most critical" of the 18.
Response: Since there is a high probability that these dent indications are either very minor or are actually false signals from the ILI, there is little benefit to be gained from excavating all of them. Investigating the most probable indications calibrates the ILI measurements and provides assurance that remaining indications are not significant. If unexpected damages are found in the most probable indications, however, then it becomes beneficial to investigate the less probable indications also.
- LMC 13: Re-word, if necessary, so that Longhorn is committed to the leak detection capabilities, not merely using them as "targets." Performance capabilities must include system availability and reliability considerations.
Response: This has been done in the revised LMP.
- LMC 13: Consider the use of frequent "shut-in" pressure tests to enhance leak detection capabilities for small leaks. Present wording of this mitigation leaves choices of techniques to Longhorn, so this would be an additional consideration

for enhancing capabilities, and would be subject to the auditing agency's, DOT, approval.

Response: The Longhorn Operations Control Dispatcher Procedures Manual requires a shut-in pressure test if an abnormal condition is observed. Abnormal conditions are defined in the operating manual. Also, a shut-in pressure test is performed each time the pipeline flow is stopped for more than a few hours. This entails closing all remotely operated block valves and monitoring the pressure on the line. If any unexpected changes occur, further investigation will be done until the cause of the pressure drop is located.

- LMC 13: The auditing agency, DOT, should ensure that leak detection capabilities are translated into appropriate and timely actions. This can occur through automation or through human intervention, but slow reactions to strong leak indications should not be tolerated.

Response: DOT will verify leak detection and response capabilities as part of their on-going audit process.

- LMC 21: The auditing agency, DOT, should ensure that camera surveillance of stations is effective, considering human engineering issues such as workload and repetition by the observers.

Response: Camera surveillance is not intended to be a primary technique for leak detection or verification of station operations. Rather, the cameras provide an opportunity for control center personnel to visually view the station grounds for indications of leaks, intruders, serious weather, or other abnormal conditions. Such viewing will often be prompted by SCADA alarms or other indications to alert the controller of the need to use the cameras. Monitors will be specifically located to make random checks more probable.

- Control center simulator for operator training

Response: It does not appear that a simulator is currently available. However, proposed operator, WES, has effective training programs for control center personnel

Other issues raised and mitigations suggested are addressed elsewhere in the EA or in other comment responses of the RS.

V. Revised LCRA Suggested Mitigation Measures

An additional set of LCRA recommendations has been reviewed. These overlap those reviewed in Section III of this appendix; but in order to facilitate cross-referencing, they are presented here, sometimes as duplications of items in Section III.

To better address the recommendations, some background information is presented here. The LCRA recommendations are focussed in the following areas termed "critical zones" by LCRA. Pipeline mileposts (MP) correlating to these areas are also shown:

1. Colorado River zone; MP 120 – M 149 and MP152 – MP 155
2. Austin area; MP 160 – MP 189
3. Lake Travis contributing zone; MP 189 – MP 220
4. Lake LBJ contributing zone. MP 228 – MP 290

LCRA also refers to the Pedernales watershed which is interpreted to be the following pipeline MPs:

Pedernales watershed; MP 189 – MP 220

Examining these areas in terms of the EA-assigned tier designations and probability of failure scores (Index Sums) after mitigation produces the following table:

Tier	Segment Count	Miles	Average of Index Sum	Target Index Sum
1	916	84.19	281.4	200
2	602	45.70	293.6	240
3	205	9.79	308.8	280

The EA describes the basis of the tier designations for sensitivity to spills. The EA also explains the rationale for the target Index Sums for each tier. The table above illustrates that the post-mitigation probability-of-failure levels exceed the targets on average, and that no part of the pipeline is below its target value.

Seven additional check valves have been (or will be) installed in these areas at the following MP locations:

- MP 171.50
- MP 175.51
- MP 193.24
- MP 199.43
- MP 203.62
- MP 210.00
- MP 213.31

These valves operate automatically to reduce the amount of drainage from a pipeline leak. They have been located specifically to produce the greatest benefit in terms of spill size reduction.

The LCRA recommendations and corresponding responses are shown below.

LCRA Recommended Mitigation Measures

The following summary of mitigation measures draws upon LCRA's comments of January 5, 2000 regarding the draft Environmental Assessment of the Proposed Longhorn Pipeline System (October 1999) as well as upon discussions and additional analyses that have been conducted since October.

1) Mitigating the effects of a spill

- a) Prohibit MTBE as a product, constituent, or component of any product. Limit products to be transported to gasoline (as currently commonly formulated) jet fuel, diesel fuel, and crude oil. Conduct an independent comprehensive spill fate and transport analysis as well as an exposure risk assessment for any new products or additives proposed for transport by the pipeline.
- b) Spill response
 - i) Fully planned, funded, trained, and equipped emergency response capability.

The FRP includes detailed planning for activities at likely work sites and describes an extensive network of Longhorn and contractor response organizations. The addition of Boots & Coots Special Services as the primary response contractor provides additional fire fighting capability. The establishment of a B&C office in Austin cuts response times in the critical central portions of the pipeline. A great deal of additional planning has been done in the Edwards Aquifer Recharge and Contributing Zones, including detailed spill pathway analysis. The current FRP and contracted response organizations meet the description of fully planned, funded, trained, and equipped emergency response capability.

- ii) Fully planned with guaranteed funding for contingency supply and treatment for all potentially affected water systems – both small and large, public and private, drinking and agricultural. Planning includes qualitative and quantitative spill pathway analysis.

Longhorn has arranged for \$15 million in pollution liability insurance to cover, among other things, the costs of contingency supply and treatment of water supplies affected by a pipeline spill (see Appendix 9H in the final EA). A great deal of additional planning has been done in the Edwards Aquifer Recharge and Contributing Zones, including detailed spill pathway analysis. This was justified because of karst formations that could result in very rapid contamination of the aquifer. This level of detail is not thought to be needed in other areas where the time frame to protect drinking water is much greater.

- iii) Expedited claims procedure for private ground water users (domestic and agricultural) that may be impacted.

Longhorn has developed contingency plans for responding to claims of ground water contamination by well owners (see Appendix 9F in the final EA).

- iv) Adequate levels of liability coverage and guaranteed available funding for mitigating natural resource damages.

Longhorn has arranged for \$15 million in pollution liability insurance. The Oil Pollution Act of 1990 further guarantees funding to clean up oil spills and mitigate natural resource damages. The government can fund response and mitigation and pursue reimbursement from the facility owner(s).

- c) Spill Volume Reduction
 - i) Limit pipeline flow rate during flood flows as gauged at the Pedernales River at Johnson City. The intent of this measure is to greatly reduce the potential spill volume during times when a spill would be most damaging.

With the elimination of MTBE and similar compounds from this pipeline, the threat to Austin drinking water supplies is greatly diminished and the requirement to limit pipeline flow rates as a function of Pedernales River flow rates is not warranted

- ii) State-of-the-art leak detection SCADA and operations system for detecting large leaks (capable of detecting and responding to leaks ≥ 0.3 percent of pipeline flow rate). This includes a stand-alone redundant system for detecting large catastrophic events.

Longhorn can detect leaks >0.3 percent flow rate in a certain amount of time. Leak detection capabilities are more appropriately described in terms of leak rate and time-to-detect that size leak. Smaller leaks generally take longer to detect. The LMP specifies leak detection capabilities for each tier level.

Leak detection capabilities mandated by LMP require almost uninterrupted SCADA availability. This requires many redundancies within the SCADA system and/or offsetting actions when the SCADA is unavailable. Therefore, the ability to get high reliability is already a part of the LMP, negating the benefits of a separate redundant system.

- iii) State-of-the-art cable leak detection system for detecting small flow rate leaks. This system should be installed through the Pedernales River watershed (approximately 20 to 30 miles).

This leak detection system is to be installed over the Edwards Aquifer Recharge Zone and Contributing Zone (Slaughter Creek watershed), approximately MP 170 to 178. This is because of the potential for any leaks in this segment to rapidly contaminate the Balcones Fault Zone of the Edwards Aquifer, and thereby cause impacts to the Endangered Barton Springs Salamander. This also protects the ground water users in Sunset Valley, who could be adversely impacted by Balcones Fault Zone contamination. Modeling indicates that small leaks within the Pedernales watershed would not cause degradation of Lake Travis as a drinking water supply.

- iv) Placement of check valves, manually operated valves, and remote motor operated valves to limit spill volumes to less than critical volumes as specified by spill pathway analyses (creek, river, and lake modeling; ground water modeling).

Seven new valves have been or will be added.

2) Mitigating the probability of a spill

- a) Require Longhorn to fund and participate in an independent technical review team.

While the establishment of an oversight team is something that Longhorn may elect to do, such a team is not thought to be essential to the enforcement of an effective mitigation plan.

- b) Operations
 - i) Limit the surge pressures to less than the maximum operating pressure in the four critical zones.

This limitation is in place for all Tier 2 and 3 areas. Tier 1 areas are restricted to 110 percent of MOP during temporary abnormal conditions, as allowed by DOT regulations. Further limitations are not deemed necessary in light of the extensive integrity protection programs specified in the LMP.

- ii) Perform an annual risk assessment and operations audit (known as the Operational Reliability Assessment [ORA] in the draft EA) in conjunction with the System Integrity Plan (SIP).

The ORA is to be performed at least annually, possibly more often if triggered by any of the conditions specified in the LMP.

- c) Third-party damages
 - i) Depth of cover \geq 5 feet through the Pedernales River watershed (approximately 20 to 30 miles). Otherwise, depth of cover \geq 3 feet or equivalent barrier.

LMP commitment #5 specifies several pipeline segments that are to be reburied to >5 ft of cover or equivalent in the zones of interest. LMP commitment #3 specifies that new pipe with >5 ft of cover and concrete barrier from approximate MP 170 to 189. The LMP describes an ongoing commitment to a depth-of-cover program whereby shallow areas are prioritized for re-burial based on risk factors. These efforts, along with other increased third-party damage preventions such as increased patrol, public education and ROW maintenance, are thought to appropriately mitigate the threats.

- ii) Public education, community outreach, and contractor out-reach programs.

Specified in the LMP.

- iii) Responsive, reliability 7x24 one-call system.

In place as part of WES operations and specified in the LMP.

- iv) Maintaining clean ROW with thorough signage.

Specified in the LMP.

- v) Air patrols 2.5 times per week through Colorado River watershed. Additional weekly ground patrols using vapor detection equipment through the Pedernales zone.

The LMP specifies daily patrols in the Edwards Aquifer recharges zone; every 2.5 days in other Tier 3 areas and all Tier 2 areas, and weekly in all Tier 1 areas. Coupled with the other mitigation measures, these patrol frequencies are thought to be sufficient to minimize third-party damage potential.

Vapor detection effectiveness has not been verified for the type of products transported in this project, and hence is not specified.

- vi) Concrete cap through all areas with residences, schools, day care centers, or hospitals in near proximity.

A concrete cap is recommended in some locations as an additional measure to prevent third-party intrusions. This is not thought to be an appropriate widespread requirement since it would be very disruptive to residents and other means of preventing third-party damages are available and are being applied. LPP may elect to add such barriers where specific conditions warrant it. The LMP describes an ongoing commitment to a depth-of-cover program whereby shallow areas are prioritized for re-burial based on risk factors. Barriers such as concrete caps are considered as part of this program.

- vii) No exposed or aboveground pipe.

Exposed or aboveground pipe is not necessarily more failure prone than buried pipe. There are trade offs in risk factors. The LMP describes an ongoing commitment to a depth-of-cover program whereby shallow areas are prioritized for re-burial based on risk factors.

- d) Design and construction
 - i) New state-of-the-art coated steel pipe with a design factor of ≥ 0.5 through the Pedernales River zone (approximately 20 to 30 miles).

Approximately 19 miles of new pipe with a design factor of 0.5 or better is to be installed from about MP 170 to 189. This covers the most sensitive area crossed by the pipeline.

- ii) Scour studies at stream and river crossings certified by a licensed professional engineer and subsequent engineering measures to prevent pipeline exposure.

A scour study has been performed. Results and recommendations have been reviewed by professionals with expertise in this field as part of this EA.

- iii) Comprehensive surge analysis of final design and subsequent review of analysis as part of SIP/ORA.

Several preliminary surge analyses have been performed and reviewed as part of this EA. Additional analyses are to be done whenever any related parameter changes, including changes in flow rates, product type, or hydraulic configuration of the system. This is specified in the LMP as part of the management of change (MOC) process.

- iv) Establish acceptable future pump station citing and design criteria including secondary containment of potential spills. Supplemental EA required.

The LMP specifies that Longhorn will prepare site-specific environmental studies for each planned pump station. Studies are to be submitted 180 days prior to intended construction dates. Designs and construction are subject to audit by DOT.

- e) Corrosion protection
 - i) Hydrostatic testing – eight hours at 90 percent SMYS—prior to initial operation and on periodic basis according to SIP/ORA through Bastrop County area, Austin zone, Pedernales River watershed, Sandy Creek watershed, Llano River zones, and all other Tier 3 areas (approximately 200 miles).

The LMP has these provisions for the areas listed and for all other older portions of the pipeline. Additionally, the entire pipeline is to operate at a reduced pressure until an ILI is completed and ORA calculations indicate that an appropriate safety margin exists. These provisions are thought to provide a high level of integrity verification, especially in areas where spills are potentially more consequential.

- ii) Use of in-line detection instrumentation (smart pigs) on a periodic basis according to SIP/ORA through Bastrop County area, Austin zone, Pedernales River watershed, Sandy Creek watershed, Llano River zones, and all other Tier 3 areas (approximately 200 miles). Initial test within three months of startup.

The LMP has these provisions for the areas listed and for all other older portions of the pipeline.

- iii) Annual close interval surveys throughout the Austin zone and the Pedernales watershed until independent technical review team approves change.

An initial (before start-up) close interval survey is to be conducted in Tier 3 areas and all other areas not covered by the 1998 close interval survey. Close interval surveys are then conducted annually for Tier 3 areas and on a frequency determined by risk management for other areas.

- iv) Cathodic protection system.

A cathodic protection system is installed over the entire pipeline. This is one part of the two-part defense system against corrosion of buried pipe. Coating is the other line of defense. Cathodic protection effectiveness is verified through surveys, tests, and inspections as described in the LMP.

- v) Replacement and reconditioning of weak areas as determined by SIP/ORAs.

This is specified in the LMP. Parameters and details for criteria and scheduling are provided therein.