Kei th !

Imperial Oil

Imperial Oil Resources
7057, 237 - 4th Avenue S.W.
Calgary, AB T2P 0H6

J.F. (John) Elliott, P.Eng.
Manager, Operations Technical
Subsurface Engineering

Phone: (403) 237-3058
Fax: (403) 232-5892
E-mail: john.f.elliott @ esso.ca

Filed: GOV/GC/EUB/CAF
(Indicate File Classification)

EUB RESOURCES APPLICATIONS
DATE REGISTERED
APR 1 1 2006
SUBMISSION # 37748
RE: APPLN # ______

RECEIVED
EUB RESOURCES APPLICATIONS

March 31, 2006

Alberta Energy and Utilities Board
640 - 5th Avenue SW
Calgary, Alberta
T2P 3G4

Attention: Mr. Keith Sadler, P. Eng.
Section Leader, Applications
Reservoir Development Group

Dear Mr. Sadler:

Re: Imperial Oil's 2005 Casing Integrity Report

This report is being issued to satisfy the conditions of EUB Decision 99-22, Condition #9 and clause 6.2 of AEUB Approval 8558.

This is the sixth annual report to be submitted, and as such is intended to build on the information that was included in the previous report, with focus on 2005 performance.

Imperial Oil firmly believes that the comprehensive casing integrity program that is in place at Cold Lake provides the necessary operating practices and procedures to ensure integrity within our operations.

Should you wish to meet and discuss the contents of this report further, please do not hesitate to contact the undersigned at 403-237-3427 or Jamie Taylor at 780-639-5217.

Yours truly,

Jamie Taylor

for Mark Taylor, P. Eng.
Cold Lake Reservoir and Subsurface Engineering Manager

cc. Don Hennessey — Field Centre Team Leader, AEUB - Bonnyville
D.J. (Darrell) McOuat — Field Superintendent, Cold Lake Operations, IOR
J.A. (Jamie) Taylor — Subsurface Supervisor, Cold Lake Operations, IOR

Annual Summary Report on Casing Integrity

Submitted March 2006

Introduction

Pursuant to the requirements of AEUB Decision 99-22, Condition #9 and clause 6.2 of AEUB Approval 8558, Imperial hereby submits the 2005 annual summary report on casing integrity and remediation efforts.

This report is the sixth annual report to be submitted, and as such builds on the information that was included in the previous reports, with focus on 2005 performance and work.

For the purpose of these annual reports, a casing failure is defined as a break or crack in the production casing that results in the well no longer being capable of containing pressure.

2005 Overview

Failures with Potential Environmental Consequences

- **1** Near surface casing failure
- **16** Intermediate depth casing failures (all level 0 consequence)
  - 16 primary commercial intermediate failures (6 operational, 10 casing integrity check)

Failures with Economic Impact Only

- **51** Clearwater (producing zone) casing failures

Items for discussion

- Near Surface Corrosion analysis and Operating Practice upgrades
- G03 Pad casing integrity performance
- Introduction of Low Pressure Operating Practice (OP #10)

Environmental Consequence Assessment for Casing Failures

In 2001 Imperial developed a matrix to classify the environmental consequence associated with all surface and intermediate casing failures. The intent of this classification is to allow for an analysis of the number of failures and environmental consequences associated with these failures. As there are no environmental issues associated with Clearwater top failures, this matrix is not applied to that category.

The matrix is shown in Table 1, and shows that there are four potential consequence levels that could be assigned to any given failure. Level 0 is the lowest level and Level 3 is the most significant consequence level.

The assigned consequence level is dependent on four considerations that need to be evaluated for each failure:

1) Total Volume Released.
2) Time to remediate (pumping days).
3) Was an aquifer contacted by the released fluids?
4) Was there a surface release?

Each of these factors must be considered when evaluating a failure, and a discussion is held between the appropriate individuals at Imperial to assign the final consequence level.

Table 1

Environmental Consequence Assessment Criteria for Casing Failures

Consequence Level	Total Volume Released of Produced water, CaCl2, Bitumen, or steam (m3)	Time to Remediate (pumping days)	Aquifer Contacted	Surface Release
3	>5000	>180	Yes	Yes
2	1000 - 4999	60 - 179	Yes or No	Yes or No
1	100 - 999	10-60	Yes or No	Yes or No
0	0-99	0-9	Yes or No	No

For the 2001 report, Imperial Oil reviewed all of the surface and intermediate casing failures that had occurred since the inception of the current casing integrity program in 1996 and classified the associated environmental consequences using the above matrix.

Figure 1 shows the various consequence levels associated with the casing failures near surface that have been experienced in Cold Lake since 1996. As highlighted in previous annual reports, only one of the failures falls outside of the Level 0 environmental consequence level. The near surface failure that occurred on H01-03 in 1996 was assessed as having a level 2 consequence. All of the remaining surface failures have been assessed as having a Level 0 environmental impact, and there was one near surface failure in 2005.

Figure 2 shows the consequence levels associated with the intermediate failures that have been experienced in Cold Lake since 1996. For the intermediate failures, as highlighted in previous annual reports, only two of these fall outside of the Level 0 environmental consequence level, Both of these failures, H15-10 and E10-12, occurred in 1999 and were assessed as having level 1 consequences. All of the intermediate failures that occurred in 2005 were assessed as having a Level 0 impact.

Figure 1

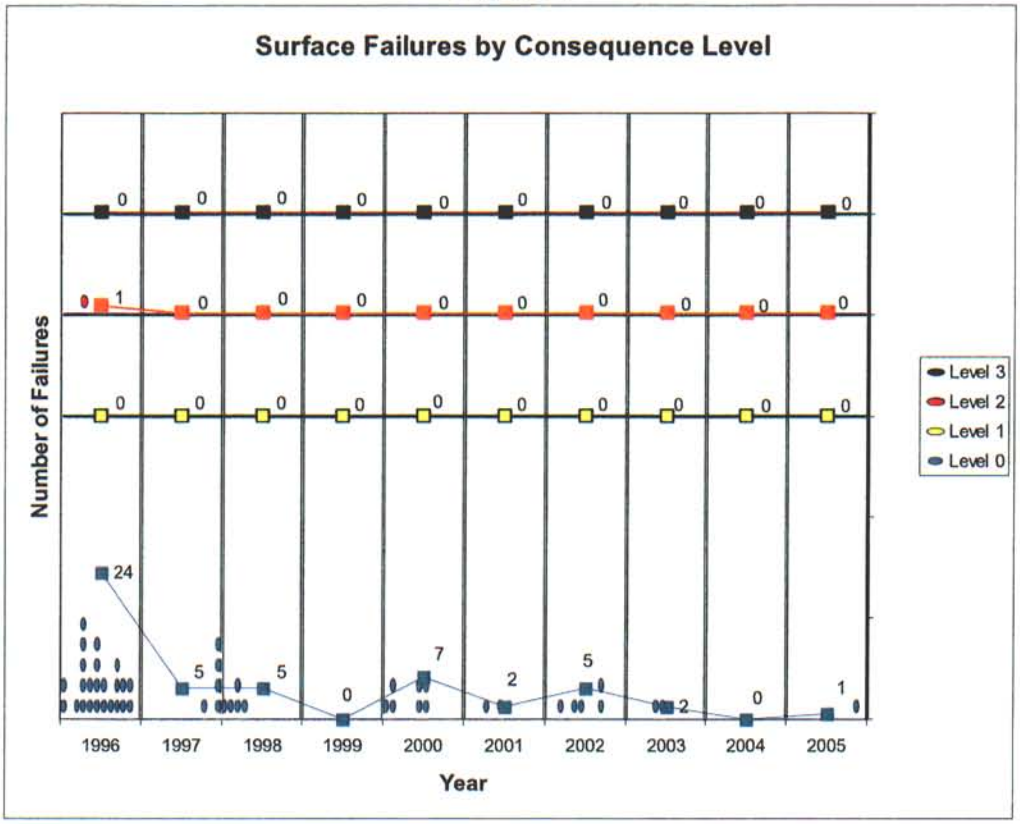
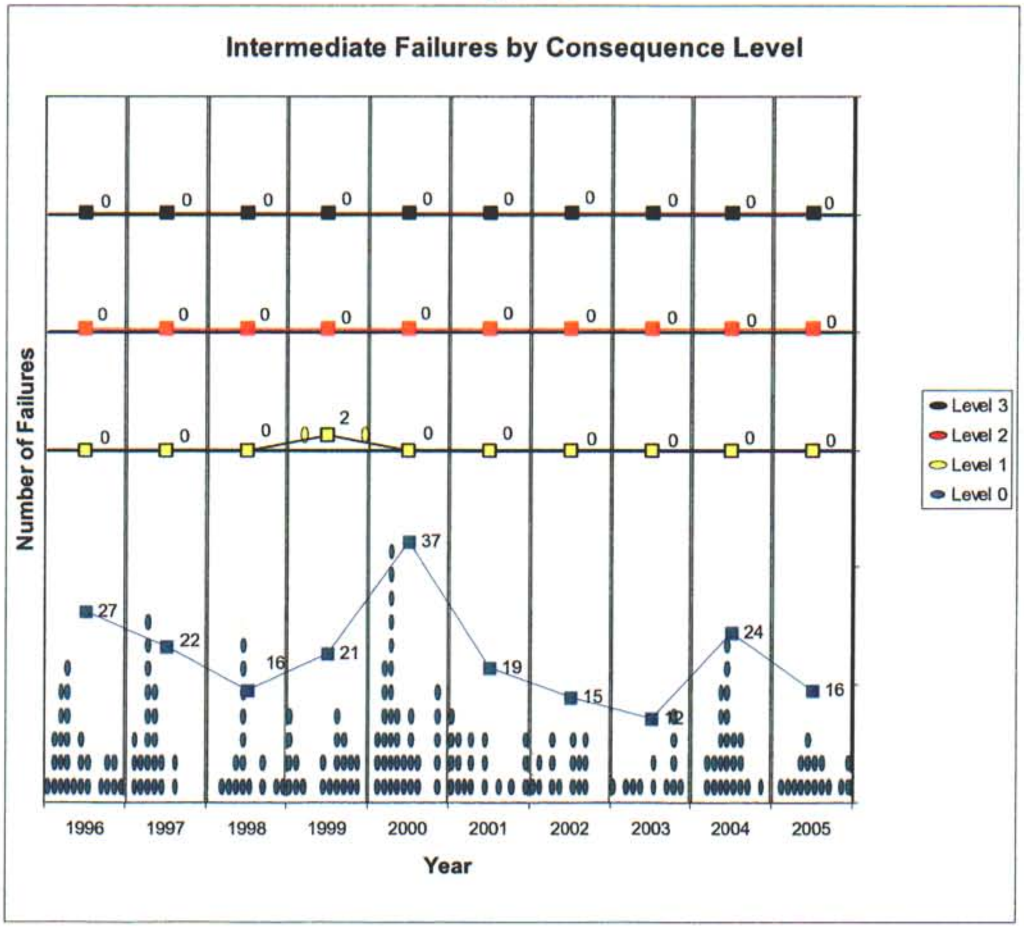


Figure 2



This matrix and analysis provides a very useful tool for having a more complete discussion on casing integrity as it applies to Imperial Oil's Cold Lake Operation. The number of failures that occur is certainly one aspect of the discussion, but by including in the discussion the environmental consequences associated with the failures, a more complete and meaningful discussion can occur.

It is Imperial Oil's intention to continue to assess each surface and intermediate failure that occurs in the future using this matrix. If required, future modifications to the matrix will be made to improve the usefulness of this assessment.

Historical Cold Lake Casing Integrity Performance

Casing Failure Locations

Concerns with casing failures have been identified at three separate depth intervals within Cold Lake operations as follows:

- Glacial Till near surface (0 - 25m);
- The intermediate wellbore, which includes the Quaternary, Colorado Group (shales section) and Grand Rapids formation (25 - 420m TVD);
- Production zone, at the interface between the Clearwater Formation and the Grand Rapids Formation.

Undetected near surface and intermediate well failures have the potential to contaminate aquifers or breach to surface. Production zone or Clearwater failures only affect the serviceability of the well and the ability to recover reserves from the Clearwater reservoir. The existing casing integrity program for Cold Lake was designed to address the concerns associated with the near surface and intermediate wellbore intervals, and was not intended to deal with the failures within the production zone.

1. Near Surface Casing Integrity (0 - 25m)

A) Performance

External corrosion is the main cause of casing failures near surface, but is not active in the rest of the wellbore. The corrosion occurs in the casing to conductor annulus if the cement had slumped as it was setting up. The resulting annular space fills with wellhead and surface water runoff, which sets up a corrosive environment in the form of a cathodic cell.

Corrosion inspections (electromagnetic flux leakage inspection logs) and casing pressure tests are completed as part of the ongoing casing integrity program. Should a well with extensive corrosion be found the well is either repaired, pressure tested to ensure suitability for service, or taken out of steam service. For new wells, this issue has been addressed through improved cementing design and practices. Current practices are in place to ensure that if cement is not close to surface in the production casing annulus, the well will be repaired (washover technique), or it will be considered unacceptable for CSS service. Wells that have cement tops near surface are topped up with bentonite or cement after the first steam cycle.

Figure 3 illustrates the number of commercial surface failures by year, that have been experienced in Cold Lake since 1991. To the end of 2005, a total of 80 commercial wells have experienced a failure in the top 25m of the wellbore. The peak shown in 1996 correlates with the first year of implementing the casing integrity program, with a large portion of the increase representing failures that were found as a result of doing the pre-steam casing inspection. In addition, a further 106 wells have been either repaired or taken out of steam service due to excessive wall loss. As indicated by the data outlined in Figure 3, the number of near surface casing failures has been reduced significantly since 1996. There was one surface failure in 2005 on well D62-05.

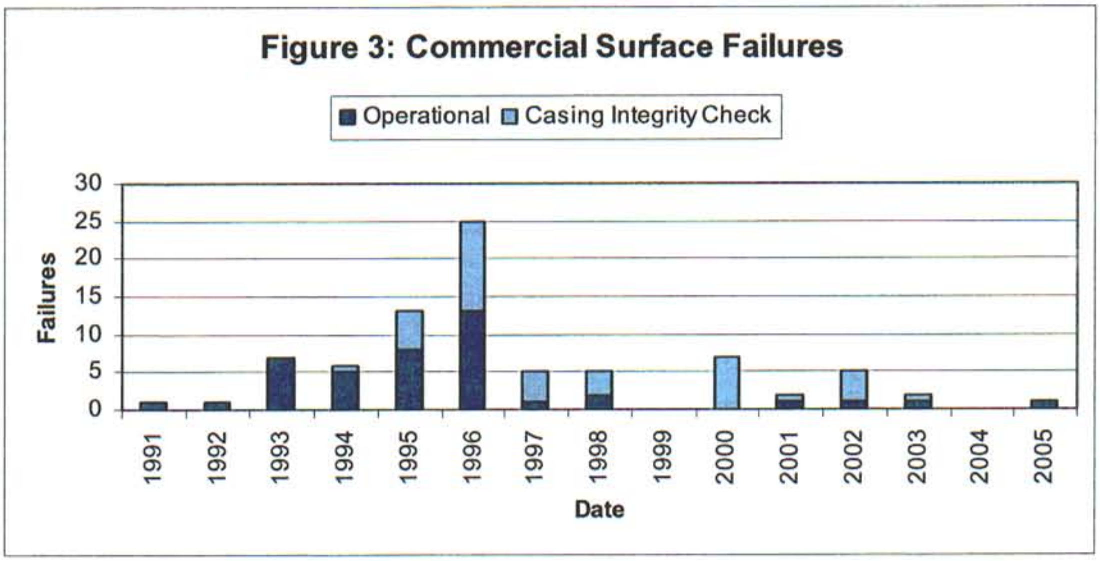


Table 2 provides the detail on the single surface failure that occurred in L80/IK55 casing grades in 2005 (D62-05).

Table 2

No.	Official Well Name	Well Licence #	Date Failure Detected	Failure Depth (mKB)	Cycle #	Casing Details				Multiple Failures?	Detection Method
						Size (mm)	Weight (kg/m)	Grade	Connection		
1	IMP 93 D62-05 COLDLK 14-36-64-4 C.I. Check = Casing Integrity Check N2 process = N2 soak/N2 purge/Fluid shots	157791	1-Nov-05	4.2	7	177.8	34.2	L80	OSBTC	N	Visual

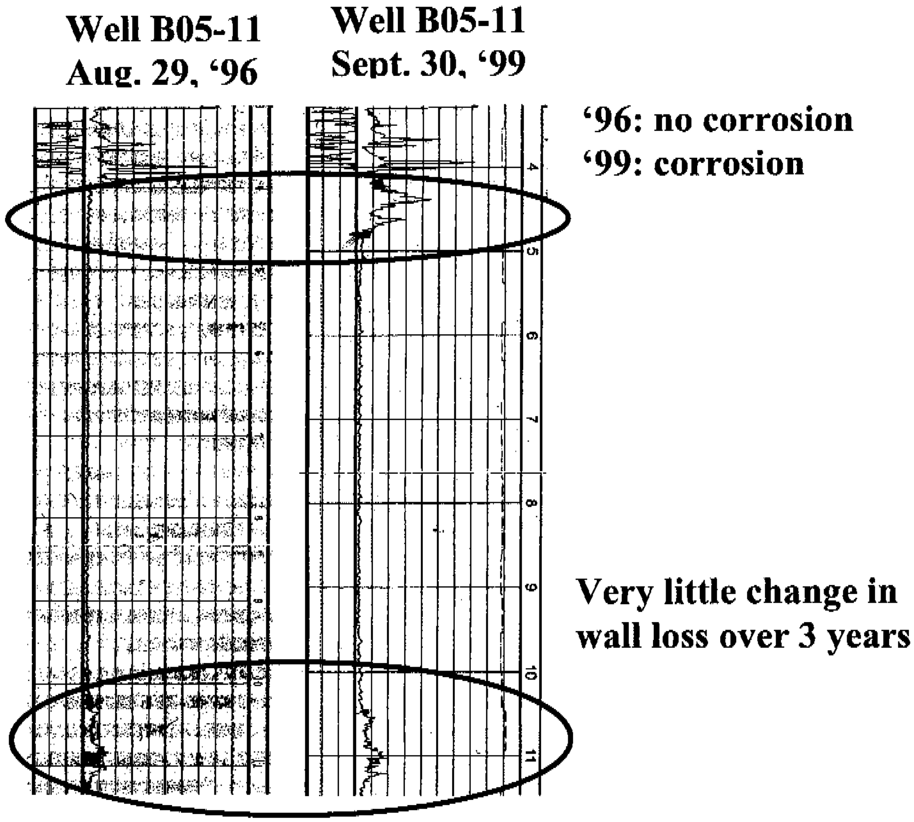
It is Imperial Oil's belief that fewer surface failures are occurring because of improved cementing and top up practices that were implemented in 1996. The existing operating practices have been successful in proactively detecting damaged wells, and in reducing the environmental consequences of a failure. However, a historical analysis of external corrosion completed on Cold Lake wells in 2005 indicated that an upgrade to existing practices was required and is outlined below.

B) Near Surface Corrosion:

In early 2005 an extensive study was completed to evaluate external corrosion rates utilizing corrosion inspection logs completed since 1996. It was found that corrosion rates had significantly decreased since the implementation of Bentonite top-ups in 1996, and in most cases corrosion rates were negligible at the original primary cement top depth. This confirmed that the operating practices implemented to mitigate corrosion at the primary cement top had been highly successful.

However, as a part of the investigation it was discovered that a new corrosion cell had developed much closer to surface in a small number of wells. This is illustrated below in the comparison between two Vertilogs completed on the same well 3 years apart. The 1996 Vertilog was completed at the time of the original cement top up and the 1999 Vertilog was completed during a routine casing integrity check.

Figure 4



Upon further investigation it became evident that in certain cases some top ups had degraded over time and a new corrosion cell had been created close to surface within the first meters of the conductor pipe. Imperial completed an in depth investigation to evaluate the risk of this new corrosion cell. The results indicated that corrosion rates are much lower in this new cell and failure rates are significantly below failure rates seen on older wells at the primary cement top.

Table 3 confirms that surface failures due to near surface corrosion are occurring at a much lower rate than what was seen prior to the new cementing and top up practices. If corrosion was occurring at the same rates as the pre-top up work from 1996, 11 failures would have been expected to date. Only 1 failure has been detected on wells drilled with upgraded cementing practices and operated under the casing integrity operating practices. Also, casing wall loss very near surface (<1m below the wellhead and conductor pipe top) using casing inspection logs is typically overstated due to the close proximity to the wellhead and conductor pipe top. By analyzing the near surface failure rates of wells drilled after the implementation of new cementing and top up practices, and the likely overstatement of wall loss measurements very near surface (<1m deep), Imperial believes that the corrosion rates are significantly lower in the very near surface corrosion cell.

Table 3

Well Age (years)	Historical Surface Failures[2]	Historical Failure Frequency	Number of New[1] and Upgraded[1] Pads that have been through Age Category	Number of Predicted Failures on New[1] and Upgraded[1] Pads Based on Historical Frequency	Number of Actual Failures on New[1] and Upgraded[1] Pads
<5	0	0	102	0.0	1
5-6	2	0.001	50	1.2	0
6-7	4	0.002	45	2.2	0
7-8	6	0.003	39	2.8	0
8-9	11	0.0055	21	2.8	0
9-10	16	0.008	12	2.3	0
10-11	13	0.0065	1	0.2	0
11-12	4	0.002	1	0.0	0
12-13	5	0.0025	0	0.0	0
13-14	5	0.0025	0	0.0	0
14-15	4	0.002	0	0.0	0
15-16	4	0.002	0	0.0	0
16+	2	0.001	0	0.0	0
Totals		0.038		**11.4**	**1**

[1]New & Upgraded Pads are pads that have been operated under the Casing Integrity Operating Practices, and drilled using upgraded cementing practices.
[2] This column is the surface failures on wells operated prior to the implementation of the Casing Integrity Operating Practices.

Four major factors contributing to external corrosion rates in Cold Lake CSS wells are temperature, chloride concentration, oxygen and the presence of water. Improved operating practices and stuffing box packing materials have minimized minor leaks of produced water into the conductor pipe-production casing annulus, reducing the amount of casing exposed to salt and produced fluids. Bentonite top-ups and better cementing practices have reduced the volume in the conductor pipe-production casing annulus in which corrosion can occur. Both of these factors are believed to be contributing to reduced corrosion rates.

<u>Casing Integrity Operating Practice #8 - Conductor pipe top-up Practice</u> was created to document standards related to managing external corrosion of production casing in Cold Lake. These standards have been updated to reflect increased maintenance and inspection requirements and document the accountabilities of personnel involved with managing Bentonite top-ups in Cold Lake. A recent program was planned and executed in 2005, with 39 pads topped up according to the upgraded Operating Practice #8.

All pads will be evaluated for top ups annually, and top ups will be implemented where necessary. In the future, a more rigorous annual maintenance plan has been put in place to prevent future cement top / Bentonite top degradation. The near surface corrosion issue will continued to be monitored and evaluated over time, and surveillance and maintenance procedures will be upgraded as required.

2. Intermediate Casing Integrity Performance

Commercial Casing Design Information

The following information is for intermediate casing failures that have occurred in 177.8mm, 34.2 kg/m, L-80/IK55 cased wells (also referred to as Commercial design) and does not include the early casing designs, such as SOO-95 casings. During 2005, there were no failures on wells of these earlier designs in CSS operation.

As described in previous documents submitted to the EUB, Cold Lake Expansion Project - Volume 1: Project Description (February, 1997), the primary cause of intermediate wellbore failures has been determined to be environmental cracking, with fatigue considered a contributing factor.

Several steps have been taken in an effort to reduce the number of failures associated with these mechanisms. Improved casing connection design to reduce steam seepage on new wells and better steam water alkalinity control are aimed at reducing the occurrence of stress corrosion cracking failures. Tannin to caustic ratio management for Boiler Feed Water (BFW) was introduced in January 2003 to minimize failures due to caustic stress corrosion cracking (CSCC). In addition, nitrogen purging or trickle steaming are used to remove the presence of H_2S in the casing - tubing annulus during shut-in periods, mitigating the occurrence of failures due to sulfide stress corrosion cracking.

Since the implementation of the casing integrity operating practices in 1996 to year end 2005, a total of 172 primary intermediate casing failures have been detected in the 177.8mm, 34.2 kg/m, L-80 & IK55 casings. The consequences associated with these failures have been significantly reduced over previous years:

- No multi-well failures have occurred.
- Only 1 of the 172 intermediate failures required aquifer remediation.
- 123 of these failures (~72%) were identified during the pre-steam casing integrity checks.
- 261 additional wells have been taken out of steam service or repaired due to intermediate impairments or excessive deformation.

Figure 5 summarizes, by year, the number of primary intermediate casing failures at Cold Lake for all 177.8mm, 34.2 kg/m L-80 & IK55 casings from 1988 to December 31, 2005. The data is broken into three classifications based on early, mid, and late cycle groupings, and shows that the number of early cycle failures has historically been lower than the late and mid cycle failures.

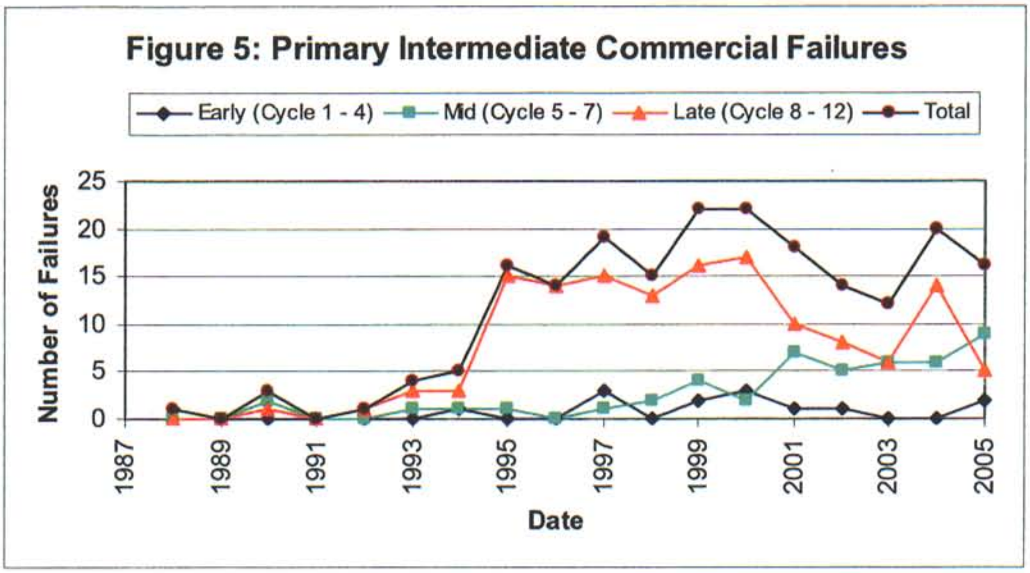


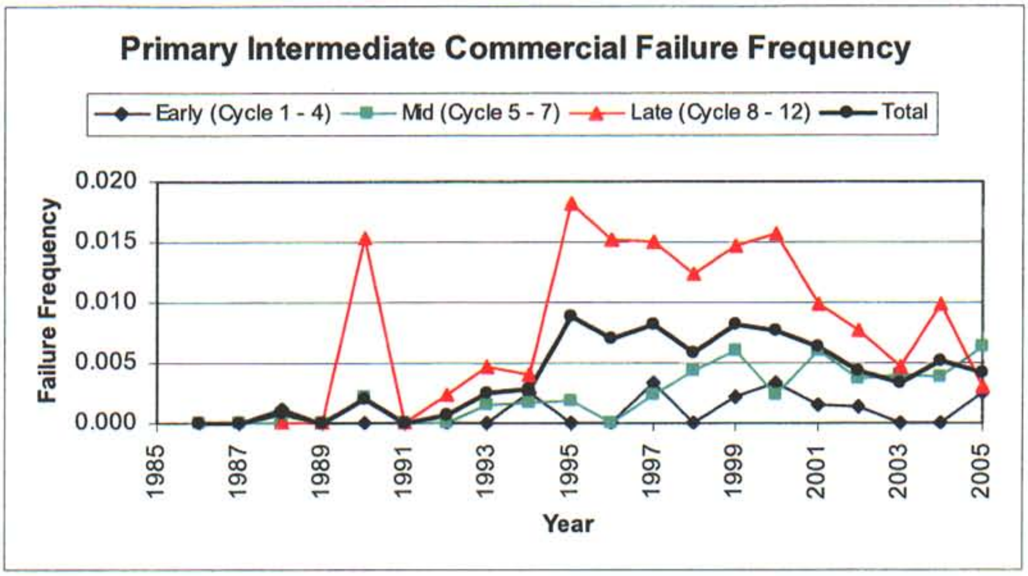
Figure 6 is a plot of the failure frequency by year of the early, mid and late cycle wells. The failure frequency is based on the number of failures that occurred in a given year in one of the three classifications divided by the number of wells that were in that classification for the given year.

The data in Figure 6 shows that the failure frequency for later cycle wells has been historically higher than for early and mid cycle wells, but is on a downward trend since 1995. Imperial believes this decrease is due to the combination of removing wells with impaired casing from steam service, and controlling the operating environment.

As expected early and mid cycle failures are rare and continue to maintain a flat profile. The late cycle intermediate failure frequency has been on a decreasing trend since the Casing Integrity Operating Practices were implemented in 1996. Although late cycle intermediate failures did increase in 2004, the failure frequency for 2005 is the lowest recorded frequency since 1996. All late cycle intermediate failures from 2005 had a Consequence Level of 0. Overall, the intermediate casing failure frequency is the second lowest since1996.

In looking at the total failure frequency for Cold Lake, there has been a significant reduction in this number since the implementation of the overall casing integrity program in 1996. This reduction in total failure frequency in combination with the associated environmental consequences shown in Figure 2 indicates that the improvements made in the areas of design, installation, operation, detection and response are showing overall benefits to Cold Lake Operations.

Figure 6



Figures 7, 8 and 9 document when failures for the early, mid, and late cycle wells, were detected. An operational failure would be one that was detected with either the DFP (Delta Flow and Pressure) program during steam injection or with the nitrogen Soak program during the soak portion of the cycle. A casing integrity check failure would be one that was detected as part of the pre-steam casing integrity check process.

As a result of the low number of failures experienced in the early cycle wells, the data does not show any trend. However, with the mid and late cycle charts (Figures 8 & 9), the data illustrates the pre-steam casing inspection program is finding a significant number of the failures.

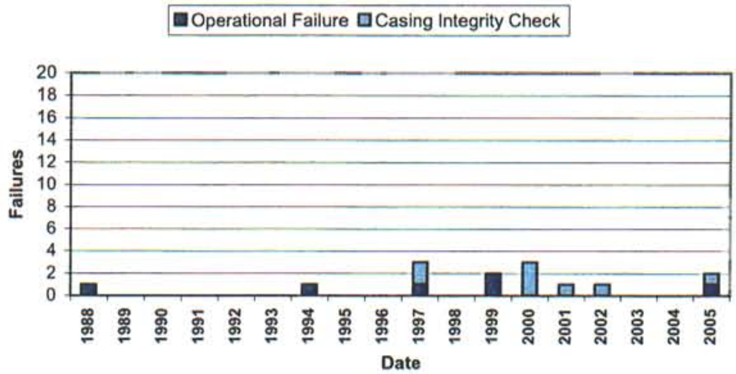


Figure 7: Early Cycle Primary Intermediate Commercial Failures

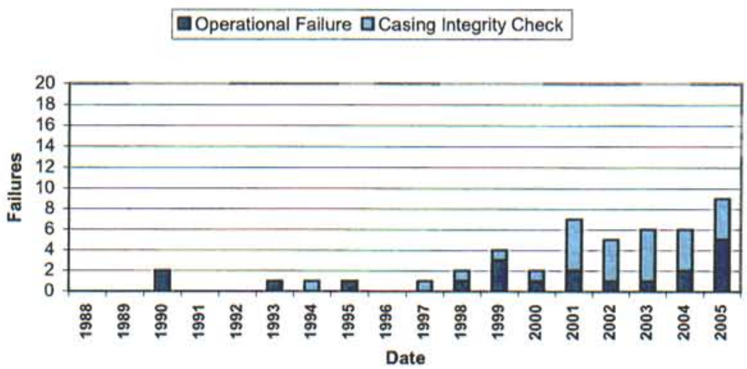


Figure 8: Mid Cycle Primary Intermediate Commercial Failures

Figure 9: Late Cycle Primary Intermediate Commercial Failures

Table 4 provides the individual well details on the 16 intermediate failures that occurred in L80/IK55 casing grades in 2005.

Table 4
2005 Intermediate Failures

No.	Official Well Name	Well Licence #	Date Failure Detected	Failure Depth (mTVD)	Cycle #	Casing Details				Multiple Failures?	Detection Method
						Size (mm)	Weight (kg/m)	Grade	Connection		
1	ESSO 83 A4-7 COLDLK 4-14-65-4	103945	17-Feb-05	262	9	177.8	34.2	N80	OSBTC	N	C.I. Check
2	IMP 01 V01-17 COLDLK 11-34-64-3	254043	6-Mar-05	476.5	3	177.8	34.2	L80	NSCCM	N	C.I. Check
3	ESSO 87-D52-14 COLDLK 10-35-64-4	126969	21-Apr-05	232.3	8	177.8	34.2	L80	OSBTC	N	C.I. Check
4	ESSO 84 H4-7 COLDLK 13-22-65-4	111146	3-May-05	284.6	11	177.8	34.2	L80	OSBTC	N	C.I. Check
6	IMP 04 HRZ H15-H3 COLDLK 11-27-65-4	302766	18-May-05	52.8	1	219.1	53.6	L80	NSCCM	N	N2 Purge
5	IMP 95 L06-27 COLDLK 13-21-65-4	173956	2-Jun-05	290.6	9	177.8	34.2	IK55	QB2	N	C.I. Check
7	IMP 97 H37-16 COLDLK 9-3-66-4	206968	7-Jun-05	412	6	177.8	34.2	L80	OSBTC	N	C.I. Check
8	IMP 95 H24-07 COLDLK 16-34-65-4	172067	17-Jun-05	302	7	177.8	34.2	IK55	QB2	N	N2 Purge
9	IMP 95 H23-13 COLDLK 14-34-65-4	180105	6-Jul-05	267.4	6	177.8	34.2	L80	OSBTC	N	N2 Purge
10	IMP 93 D64-15 COLDLK 4-36-64-4	155446	12-Jul-05	237	7	177.8	34.2	L80	OSBTC	N	C.I. Check
11	IMP 95 H23-02 COLDLK 14-34-35-4	180106	8-Aug-05	301.3	6	177.8	34.2	L80	OSBTC	N	N2 Purge
12	IMP 93 D63-10 COLDLK 10-36-64-4	158395	29-Aug-05	282.4	7	177.8	34.2	L80	OSBTC	N	C.I. Check
13	IMP 97 F05-17 COLDLK 6-17-65-3	213340	27-Sep-05	366.9	6	177.8	34.2	L80	OSBTC	N	C.I. Check
14	IMP 96 E10-03 COLDLK 14-25-64-4	189356	9-Nov-05	265.9	8	177.8	34.2	L80	OSBTC	N	C.I. Check
15	* IMP 97 K23-03 COLDLK 16-8-65-4	198009	4-Dec-05	271	7	177.8	34.2	L80	OSBTC	N	N2 Purge
16	* IMP 96 L11-11 COLD LK 14-28-65-4	191770	23-Dec-05	281.6	6	177.8	34.2	L80	OSBTC	N	N2 Purge
	* estimated failure depths from nitrogen purging										
	C.I. Check = Casing Integrity Check N2 process = N2 soak/N2 purge/Fluid shots										

Passive seismic monitoring has seen early success in supplementing existing intermediate depth casing failure detection systems of DFP and nitrogen soak. The primary purpose for passive seismic systems at Cold Lake is to monitor for potential fluid incursion events into the Colorado Shales at each pad. However, the casing - rock interaction when a casing string breaks is unique compared to other shear events in the rock - it has higher energy content, with a shear wave polarized in the vertical direction. This fact has made it possible to detect casing failures with passive seismic monitoring, and although the primary use of passive seismic is for detection of fluid incursion into the Colorado Shales, it has been effective as a secondary casing failure confirmation system to DFP and nitrogen soak.

B) Dual Casing

Dual Casing was installed on 93 wells (4 pads) surrounding Leming Lake in accordance with EUB decision 96-3 which required two casing strings covering the Colorado Shales, and pressure monitoring of the annulus between the casing strings for detection of primary production casing failures. These wells (currently in cycles 5 and 6) have an inner string of casing complete with a packer and a seal bore to allow for pressure monitoring, and nitrogen is utilized between the casing strings to facilitate monitoring in an inert environment.

Some minor operational issues have been encountered at the Leming Lake pads (D31, D33, D35, D36) due to minor nitrogen leak-off from the outer annulus into the main production annulus through the packer and seal bore assemblies. Primary production casing integrity was evaluated in depth and was discussed in the 2004 Annual Summary Report on Casing Integrity.

A revised monitoring plan has been successfully implemented for the last two steam cycles, incorporating pre-steam nitrogen pressure tests, differential & minimum pressure monitoring, and fluid level monitoring. The revised monitoring plan addresses surveillance during the different portions of the steam cycle (steam, soak, flowback, pumping). Imperial plans to continue using the revised monitoring plan in the future, in addition to the existing casing failure detection mechanisms of DFP, N_2 Soak and passive seismic (D31, D33, and D35 pads) to manage casing integrity on the Leming Lake Dual Cased wells.

C) G03 Pad Regional Impairments

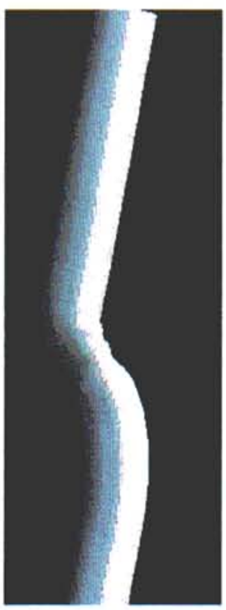
Regional impairments at G03 pad were discovered during casing integrity inspections prior to cycle 3 steam in 2001. The pad-wide impairments were located at ~ 196 mTVD in the upper Colorado Shales on all 35 wells. Prior to the submission of the report titled 'Imperial Oil Resources Second White Specs Casing Deformation Investigation Team Final Report' (Smith, Bacon, Kry, Stancliffe, 2004) to the EUB in 2004, EUB approval was required for each steam cycle. Since blanket approval to steam G03 pad was received from the EUB in July 5, 2004, G03 has been successfully operated through the steaming portion of the most recent cycle and 1 low volume mini-cycle.

G03 has just completed cycle 6/7 steaming, and most of the pad is currently on flowback, although some of the wells are soaking while adjacent to steam on other pads. As per past steam cycles the pad was block steamed (all wells steamed at the same time) in order to minimize shear stress at the depth of the casing impairments. Shear stresses are also monitored during the steam cycle, and steaming is adjusted as required to maintain the shear stress at historically safe levels.

As per previous cycles, 50% of the wells had casing integrity checks prior to the full steam cycle. In most cases these checks consisted of an inspection of the shear liner (either visual, or by running drifts through the liner at depth) as well as pressure tests to ensure intermediate casing integrity. No damage was detected on any of the shear liners and casing integrity was confirmed on all wells checked.

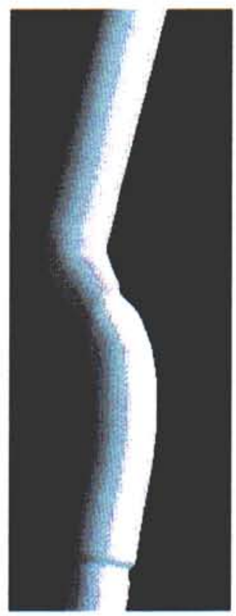
Multi-Sensor Caliper (MSC) logs were run on 2 wells prior to the steam cycle in order to determine if any significant changes had occurred to the shape of the deformations in the casing. A change in shape and or magnitude could be an indication of casing fatigue or shear damage to the casing. The impairment on G03-29 before and after steam is shown in **Figure 10**.

Figure 10



Left: Three dimensional representation of MSC log on well G03-29 showing the casing impairment at 196 mTVD completed 2003/10/27 prior to cycle 5 steam.

Right: Three dimensional representation of MSC log on well G03-29 showing the casing impairment at 196 mTVD completed after cycle 5 steam, showing no additional pipe deformation due to cycle 5 steaming.



It can be seen from **Figure 10** there was no significant change in the characteristic of the impairment.

The key strategies utilized at G03 to maintain wellbore integrity include:

1) Casing integrity checks prior to steaming to evaluate well integrity.
2) Installation of shear liners to reduce the effect of fatigue on the impairments.
3) Shear stress management to reduce shear stress as low as practically possible during steaming.
4) Completing thorough multifunctional reviews (including risk assessments) of casing integrity prior to steaming.

Imperial's approach to managing casing integrity at G03 has proven successful through 7 cycles of high pressure steaming. Imperial plans to continue to apply the proven strategies in maintaining wellbore integrity on G03 in future cycles, and results of this program will continue to be included in the annual report on casing integrity.

D) Low Pressure Operation of Producer Only Wells (POWs) Adjacent to Steam

The Casing Integrity Operating Practices were originally designed to mitigate casing integrity related risks in high pressure steaming environments. As the Cold Lake asset matures, a number of the pads are being operated into late cycles. These wells that are operated into late cycles are typically steaming/operating at lower pressures, and some of the casing integrity practices which were developed are not always applicable to the reduced level of risk with lower pressure steaming.

To enhance wellbore utility in later cycle pads, a low pressure casing integrity operating practice is being implemented. The inclusion of a specific Casing Integrity Standard for POWs in low pressure steaming areas will ensure standardization of this practice throughout Cold Lake. An analysis of casing inspection logs run since 1996 was completed in early 2005. This analysis indicated that top-up practices were effective in reducing external corrosion of production casing when applied correctly, and also indicated a conservative post top up corrosion rate could be used to assess wellbore corrosion on low risk POWs. This is different from the previous philosophy in Cold Lake, and Imperial will now be utilizing a corrosion assessment philosphy versus the previous corrosion inspection philosophy.

The major changes that are being introduced are:

1) Reduction in Casing Integrity requirements for POWs in low pressure environments where intermediate casing failures are low risk.
2) Introduction of Corrosion Assessments on POWs in low pressure environments (replacing corrosion inspections) - where wall loss determination will be based on results from an original Vertilog combined with historical corrosion rates on CSS wells.

This new standard is divided up into two main areas: POWs in steaming areas where reservoir pressure will not exceed 4 MPa, and POWs in steaming areas where reservoir pressure will be between 4-6 MPa. One of the major components of this new standard involves a study of historical reservoir pressures and a detailed monitoring plan to ensure reservoir pressure will be controlled and monitored within the preset 4 and 6 MPa parameters.

<4 MPa Reservoir Pressure: In the case where reservoir pressure will not exceed 4 MPa no Casing Integrity Checks (wellbore pressure tests and in some cases Vertilogs) will be completed on POWs. When a POW well is operated adjacent to a steaming well where reservoir pressures will not exceed 4 MPa the risk is similar to the same well being produced without adjacent steam. Although a failure may develop, minimal fluid leak-off would occur at this low pressure as the reservoir fluids will likely kill the well as the fluid level rises to the failure depth.

<6 MPa Reservoir Pressure: In the case where reservoir pressure will reach between 4 and 6 MPa, the risks are higher than 4 MPa steam service, however significantly reduced from standard high pressure service. In this case, casing integrity checks are required on wells where there is a risk of fluid loss into the formation or to surface.

Mitigation for 4-6 MPa POW operation:

1) Wells with casing integrity issues are identified and corrosion assessments are completed if required.
2) Pressure monitoring plans are developed, documented and enforced.
3) Wells are purged and put on N2 Soak at 4 MPa reservoir pressure.
4) Required Casing Integrity checks are completed prior to steaming.

These standards have been successfully applied in the field in recent years. Each year the Casing Integrity Operating Practices are reviewed and evaluated by key personnel. This upgrade is part of the natural process of evolving standards as conditions and learnings develop over time.

3. Clearwater Casing Integrity Performance

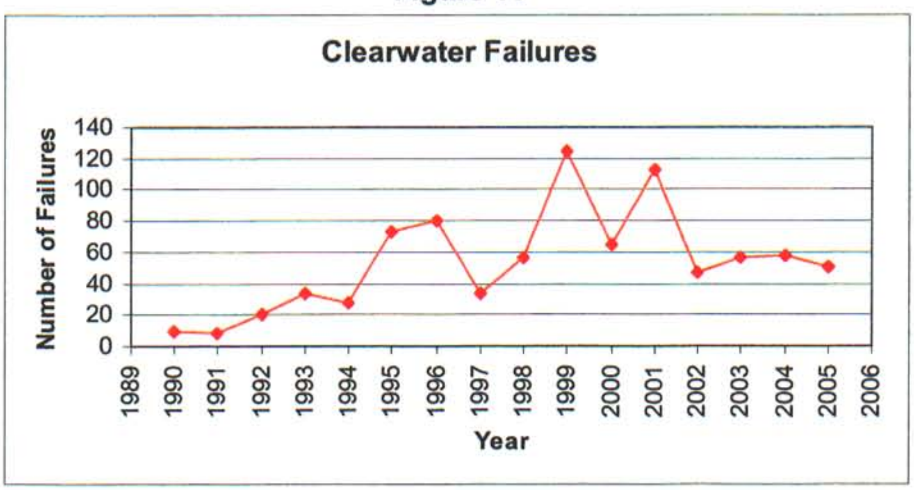
As previously documented, formation movement is the main casing failure mechanism at the top of the Clearwater formation. As a result of the CSS process, shear stresses develop between the Clearwater and the Grand Rapids formations. These stresses can cause strain and slip along structurally weak planes or surfaces, which exist near the interface between the Clearwater formation and the Grand Rapids formation, and have resulted in a number of shear type failures in this interface area. As this shear is localized, there is no impact on uphole casing integrity. There has been no evidence that a Clearwater failure causes, or is related to other intermediate depth or near-surface casing failures. Because of this, there are no environmental impacts and the main impact is restricted to the serviceability of the well and the ability to recover reserves from the Clearwater reservoir. Tabulated results of Clearwater (producing zone) casing failures are included in table below.

Table 5
2005 Clearwater Casing Failures

No.	Official Well Name	Well Licence #	Date Failure Detected	Failure Depth (mTVD)	Cycle #	Casing Details Size (mm)	Weight (kg/m)	Grade	Connection	Multiple Failures?
1	IMP 01 U03-08 COLDLK 9-4-65-3	253368	18-Jan-05	454.8	3	177.8	34.2	L80	QB2	N
2	IMP 95 H24-07 COLDLK 16-34-65-4	172067	20-Jan-05	428.8	7	177.8	34.2	IK55	QB2	N
3	IMP 99 F06-16 COLDLK 6-17-65-3	219626	24-Jan-05	420.8	6	177.8	34.2	L80	NSCC-M	N
4	IMP 96 H34-04 COLD LAKE 3-2-66-4	189398	28-Jan-05	433.5	6	177.8	34.2	L80	OSBTC	N
5	IMP 01 U03-17 COLD LK 8-4-65-3	253378	9-Feb-05	469.1	3	177.8	34.2	L80	QB2	N
6	IMP 02 T11-14 COLDLK 13-28-64-3	268189	22-Feb-05	481.0	3	177.8	34.2	L80	QB2	N
7	IMP 00 T02-04 COLDLK 9-32-64-3	237099	24-Feb-05	475.1	4	177.8	34.2	L80	NSCCM	N
8	IMP 95 H27-03 COLDLK 11-3-66-4	182074	24-Feb-05	425.9	6	177.8	34.2	L80	OSBTC	N
9	ESSO 87 D52-12 COLDLK 14-35-64-4	126967	2-Mar-05	412.0	7	177.8	34.2	L80	OSBTC	N
10	IMP 99 Y36-08 COLDLK 6-31-64-3	224562	10-Apr-05	470.1	6	177.8	34.2	L80	SWNA	N
11	IMP 96 H36-13 COLDLK 4-2-66-4	190154	25-Apr-05	436.3	6	177.8	34.2	L80	OSBTC	N
12	IMP 97 F05-03 COLDLK 4-17-65-3	213322	29-Apr-05	415.2	6	177.8	34.2	L80	OSBTC	N
13	IMP 01 U03-09 COLDLK 9-4-65-3	253369	4-May-05	451.8	3	177.8	34.2	L80	QB2	N
14	IMP 01 Y16-11COLDLK 14-31-64-3	256872	13-May-05	455.0	4	177.8	34.2	L80	NSCCM	N
15	IMP 01 U03-16 COLDLK 9-4-65-3	253377	17-May-05	452.9	3	177.8	34.2	L80	QB2	N
16	IMP 01 Y16-23 COLDLK 14-31-64-3	256887	27-May-05	456.0	4	177.8	34.2	L80	NSCCM	N
17	IMP 97 H37-02 COLDLK 16-3-66-4	206954	27-May-05	424.6	6	177.8	34.2	L80	OSBTC	N
18	IMP 97 H37-24 COLDLK 5-2-66-4	206976	31-May-05	419.2	6	177.8	34.2	L80	OSBTC	N
19	IMP 96 L11-18 COLDLK 14-28-65-4	191780	31-May-05	421.6	7	177.8	34.2	L80	OSBTC	N
20	IMP 99 F07-07 COLDLK 2-17-65-3	221766	1-Jun-05	422.2	5	177.8	34.2	L80	OSBTC	N
21	IMP 97 H37-21 COLDLK 8-3-66-4	206973	2-Jun-05	419.5	6	177.8	34.2	L80	OSBTC	N
22	IMP 97 H37-19 COLDLK 9-3-66-4	206971	9-Jun-05	421.1	6	177.8	34.2	L80	OSBTC	N
23	IMP 95 L06-09 COLDLK 4-28-65-4	173972	17-Jun-05	416.4	9	177.8	34.2	IK55	QB2	N
24	IMP 96 NN-22 COLDLK 3-6-65-3	193175	17-Jun-05	446.1	6	177.8	34.2	L80	OSBTC	N
25	IMP 97 L07-21 COLDLK 8-29-65-4	200380	20-Jun-05	437.0	6	177.8	34.2	L80	OSBTC	N
26	IMP 96 NN-20 COLDLK 3-6-65-3	193173	24-Jun-05	450.8	6	177.8	34.2	L80	OSBTC	N
27	IMP 96 NN-25 COLDLK 3-6-65-3	193178	29-Jun-05	450.4	6	177.8	34.2	L80	OSBTC	N
28	IMP 97 L07-22 COLDLK 8-29-65-4	200381	7-Jul-05	435.6	6	177.8	34.2	L80	OSBTC	N
29	IMP 96 L11-19 COLDLK 16-29-65-4	191778	7-Jul-05	429.6	7	177.8	34.2	L80	OSBTC	N
30	IMP 96 L11-14 COLDLK 13-28-65-3	191765	15-Jul-05	427.3	7	177.8	34.2	L80	OSBTC	N
31	IMP 95 L06-08 COLDLK 5-28-65-4	173975	18-Jul-05	432.6	9	177.8	34.2	IK55	QB2	N
32	IMP 02 T11-05 COLDLK 10-29-64-3	268180	19-Jul-05	478.6	4	177.8	34.2	L80	QB2	N
33	IMP 95 L06-06 COLDLK 3-28-65-3	173961	23-Jul-05	420.1	7	177.8	34.2	IK55	QB2	N
34	IMP 97 L07-15 COLDLK 8-29-65-4	200374	25-Jul-05	435.4	6	177.8	34.2	L80	OSBTC	N
35	IMP 99 F07-04 COLDLK 2-17-65-3	221698	10-Aug-05	415.5	5	177.8	34.2	L80	OSBTC	N
36	IMP 96 E08-15 COLDLK 8-36-64-4	189035	19-Aug-05	431.4	7	177.8	34.2	L80	OSBTC	N
37	IMP 00 T03-16 COLDLK 7-32-64-3	237002	20-Aug-05	480.1	5	177.8	34.2	L80	NSCCM	N
38	IMP 98 E08-19A COLDLK 2-3-64-4	218395	24-Aug-05	452.1	6	177.8	34.2	L80	OSBTC	N
39	IMP 99 F07-31 COLDLK 1-17-65-3	221728	30-Aug-05	418.4	5	177.8	34.2	L80	OSBTC	N
40	IMP 97 F05-19 COLDLK 3-17-65-3	213342	31-Aug-05	412.7	6	177.8	34.2	L80	OSBTC	N
41	IMP 97 K24-20 COLDLK 3-17-65-4	197966	2-Sep-05	427.2	7	177.8	34.2	L80	OSBTC	N
42	IMP 99 F07-33 COLDLK 8-17-65-3	221730	7-Sep-05	443.2	5	177.8	34.2	L80	OSBTC	N
43	IMP 97 F05-14 COLDLK 3-17-65-3	213333	8-Sep-05	417.3	6	177.8	34.2	L80	OSBTC	N
44	IMP 97 K23-17 COLDLK 8-8-65-4	198013	9-Sep-05	429.2	6	177.8	34.2	L80	OSBTC	N
45	IMP 97 K23-09 COLDLK 9-8-65-4	198019	21-Sep-05	430.3	6	177.8	34.2	L80	OSBTC	N
46	IMP 99 F07-21 COLDLK 8-17-65-3	221716	26-Sep-05	420.8	5	177.8	34.2	L80	OSBTC	N
47	IMP 00 T08-01 COLDLK 8-32-64-3	237201	21-Oct-05	479.3	5	177.8	34.2	L80	NSCCM	N
48	IMP 01 Y16-21 COLDLK 14-31-64-3	256885	1-Nov-05	454.0	5	177.8	34.2	L80	SWNA	N
49	IMP 99 G01-12 COLDLK 8-8-65-3	221370	2-Nov-05	426.1	6	177.8	34.2	L80	OSBTC	N
50	IMP 99 G01-18 COLDLK 13-9-65-3	221376	4-Nov-05	426.0	6	177.8	34.2	L80	OSBTC	N
51	* IMP 02 U02-19 COLDLK 7-3-65-3	273351	24-Jul-04	475.6	2	177.8	34.2	L80	NSCCM	N
	* 2004 failure reported in 2005									

Figure 11 summarizes the number of Clearwater failures that have been experienced since 1990.

Figure 11



Passive seismic systems have been extended beyond their intended application to detect a significant number of the Clearwater top casing failures. One of the limitations of passive seismic Clearwater top failure monitoring is the distance from Clearwater wellbore entry points to the passive seismic array. The acoustic energy generated by a casing failure at large distances from the monitoring well can be attenuated so that the signal to noise ratio is not sufficient for the systems to detect the event. However, passive seismic will continue to be used to monitor for Clearwater top casing failures and to verify the effectiveness of differing Clearwater casing integrity strategies, such as trickle steaming on wells in cycles 1-6.

Summary

Imperial Oil believes that the comprehensive casing integrity program (focused on design, installation, operation, detection and response) in place at Cold Lake since 1996 provides the necessary operating practices and procedures to ensure operations integrity.

- Shear stress management, shear liner installations, and comprehensive casing integrity reviews/inspections have proven successful in managing the impaired casing strings at G03 pad.
- Bentonite top-ups have proven effective at managing external casing corrosion on Cold Lake CSS wells, and upgraded top-up maintenance and monitoring practices have been implemented to ensure continued performance.
- The revised Dual Casing Monitoring plan implemented at Leming Lake pads has proven effective in monitoring casing integrity.
- Low Pressure POW casing integrity practices have been successfully implemented at Cold Lake Operations, allowing for enhanced wellbore utility while maintaining wellbore integrity.

Continued Proven Practices

- Pre-steam casing integrity checks are effective in the proactive identification of casing deformations and failures prior to placing wells on steam.
- Nitrogen purging and trickle steaming are effective in eliminating the corrosive environment in the wellbore, thus mitigating the occurrence of sulfide stress corrosion cracking failures during the soak portion of the cycle.
- Tannin to caustic ratio specification for the boiler feed water system is an effective method for minimizing failures due to caustic stress corrosion cracking.
- DFP and nitrogen soak monitoring programs are effective in the immediate detection of a potential casing failure.
- Metal to metal connections provide improved sealability, thus minimizing the potential for future failures to occur as a result of environmental cracking.
- Well control capabilities facilitate expeditious response in the event of a casing failure during the high-pressure portion of the cycle.
- Continued assessment of the environmental consequences associated with the surface and intermediate failures will provide for a more complete analysis of casing integrity performance within Cold Lake Operations.
- In addition to the primary casing failure detection monitoring systems of DFP and nitrogen Soak, passive seismic monitoring has seen early success in confirming intermediate casing failures in the Colorado Shales, and in improving understanding of Clearwater top failures.