	PIPELINE OPERATIONS AND MAINTENANCE MANUAL	**Retention Code:**
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Owner: *Designated Technical Authority*	**Approved By:** *Manager, Asset Integrity & Maintenance*	**Review Frequency:** *Five years or less*

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1.0 Introduction

The Cenovus Energy (CVE) Deep Basin Pipeline Operations and Maintenance Manual (POMM) is developed to ensure compliance with the requirements of the provincial, territorial and federal regulatory agencies, along with CSA Standard, Z662, Oil and Gas Pipeline Systems. It is a part of the Asset and Operating Integrity Program and specifically the *Pipeline Integrity Management Program*. The objective of this document is to ensure the implementation of effective procedures to continuously preserve the integrity of pipelines owned and operated by the corporation.

The POMMs are a part of the *Pipeline Integrity Management Program* and includes *Appendix Y*, a task list containing all appropriate actionable tasks described in this document and in the *Pipeline Integrity Plans* (PIPs).

This document also provides CVE operating and technical personnel with the knowledge and operating requirements to maintain a level of pipeline and facility integrity that meets corporate and regulatory expectations.

Not included in this document but deemed to be a part of it, are the operating procedures developed for each pipeline or pipeline system to deal with the requirements of this document. These procedures are maintained within the CVE Deep Basin *Competency Management* system.

1.1. Regulatory Jurisdiction

This document applies to all pipelines designed and constructed for the purpose of transporting and handling pressurized hydrocarbon liquids and gases, CO_2 and/or H_2S as gas, liquid or dense phase as well as oilfield water and steam.

In Canada, the Pipeline Act and Regulation of each province govern the design, construction and operation of pipelines. In addition to these regulations, in all cases, the applicable code is CSA Z662, Oil and Gas Pipeline Systems. The scope of this CSA standard for oil and gas systems includes pigging facilities, well sites/leases, metering stations, compressor stations and pumping stations that are part of pipeline systems. The extent of application of this standard is governed by the provincial or federal regulatory jurisdiction.

a) In **Alberta**, the Alberta Energy Regulator (AER) has primary responsibility for regulating the operation and maintenance of oil and gas production facilities and pipelines. The AER will conduct inspections and initiate enforcement action when necessary.

b) In **British Columbia,** the Oil and Gas Commission (OGC) has the primary responsibility for regulating the operations and maintenance of oil and gas facilities and pipelines. The OGC will conduct inspections and take enforcement actions when necessary.

c) **Federal Government:** if pipelines cross provincial or international borders, the National Energy Board (NEB) is the regulating authority. In these cases, the Canadian Onshore Pipeline Regulations are applied and the NEB will conduct inspections and take enforcement action when necessary.

1.2. Safety and Operating Consideration

CVE operates and maintains its pipeline systems in accordance with documented procedures reflecting the applicable industry standards, regulatory requirements and CVE expertise in the following areas:

- Safe operating practice,

- Equipment functional limits,
- Operating and maintenance experience,
- Sound engineering principles,
- Pipeline substance or service fluid, and
- Conditions that could be anticipated to cause damage

This document and the associated references describe the operating requirements and maintenance procedures of the Pipeline Integrity Management Program used by Cenovus Energy to ensure that pipelines are safely maintained and properly inspected by designated Company personnel

1.3. Required Documentation

Documented procedures and programs are required by all jurisdictions to deal with normal pipeline operations as well as any emergency condition that may occur.

This document outlines the required procedures and associated documentation for all provincial and federal pipeline jurisdictions. In a few cases, standardized forms for collecting required information are a part of this document; however, in most cases, site-specific procedures, including documentation, are a field operation responsibility.

Field operations are responsible to ensure that all changes to data normally stored in the Pipeline Inventory Register (e.g. License, Segment, Size, Substance, Class Location, Status, etc.) are updated in a timely manner within the register.

2.0 Training

Operations Managers shall ensure that each employee, consultant and contractor has the necessary technical training to be judged competent in pipeline operations and maintenance and has the safety skills to carry out these activities. Familiarization with this POMM is part of this training requirement.

Employees responsible for the operation of any of CVE Deep Basin pipelines shall, as a minimum, be knowledgeable of the following:

- The physical characteristics of the pipeline system, the contained fluids and the hazards created by a release.
- All operational procedures related to the pipeline system under their control.
- CVE Emergency Response Plan (ERP) applicable to their area of responsibility.
- CVE Safety Program including the mandatory skill and knowledge requirements to carry out pipeline operations and maintenance activities in a safe and environmentally sound manner.

3.0 Emergency Response

The CVE Emergency Response Program management defines the processes and tools that facilitate the ability of CVE to respond to emergency incidents.

Each site maintains controlled copies of the Emergency Response Core Support Plan (with site specific appendices).

3.1. Pipeline Emergency Procedures

A pipeline incident is any condition causing the unintentional release of gas, oil, salt water, or other deleterious substances from a leak or break in a pipeline. Leaks or breaks may range from a pinhole

leak in the pipeline generally caused by internal or external corrosion or material defects to a pipeline rupture caused by, among other reasons, stress corrosion cracking, external damage, or the effects of prolonged exposure of unprotected pipeline steel to a corrosive environment.

No matter how small, a pipeline leak/break is always considered a pipeline incident. Stopping the leak, informing the regulatory authorities and, if necessary, the area residents, repairing the pipe, minimizing the environmental impact, and restoring operations are critical tasks that require attention at the time of the emergency. Emergency response and incident classification shall be implemented in accordance with the CVE Emergency Management Support Plan.

Detailed pipeline information is available within the site specific sections of the Emergency Management Support Plan. This information includes, the identity of the substance transported and its characteristics, pipeline MOP and its normal operating pressure and temperature, a system map with all pipelines identified by license number and the location of all ESDV's, manual isolation valves and/or pressure/flow control valves indicated.

3.2. Controlling Pipeline Releases

When a pipeline leak or break has been identified, the following must be undertaken:

- Immediate steps to stop the source of the release.
- Any liquids must be contained and cleanup initiated using site-specific contingency plans and/or the utilization of Oil Spill Co-operatives (these plans identify methods, expertise and equipment required to deal with these situations).
- Simultaneously, the applicable regulatory agency (AER, OGC, SIR, or NEB) and HSE&SD shall be notified.

Specific procedures, if not covered under an Oil Spill Co-operative, shall be in place to clean up oil, oil emulsion, condensate or produced water spills to minimize environmental impact. Considerations include:

- Containment methods,
- Spill recovery methods including the handling and disposal of contaminants resulting from the spill,
- Use of techniques that minimize damage to vegetation, fish and wildlife,
- Location, availability and operating readiness of appropriate equipment, and
- Availability of trained personnel.

3.3. Incident Reporting

If the release fluid has the potential to cause or has caused damage to the environment or impacted health and/or property and/or caused safety concerns, the applicable regulatory agency (AER, OGC, or NEB) must be notified immediately in accordance with CVE procedure.

4.0 Operating Procedures

4.1. Pipeline Commissioning

Prior to commissioning of a new pipeline, operations will ensure that the following requirements have been met:

- A satisfactory pressure test has been completed and fully documented,

- The pipeline test pressure has been reduced to at least MOP,
- All tie-ins have been completed and inspected,
- Regulatory notifications have been completed, and
- A site-specific integrity plan has been completed and all requirements implemented.

(*Refer to section 4.5 for recommissioning an inactive or discontinued pipeline*.)

4.2. Leak Detection

A leak detection manual shall be developed for liquid hydrocarbon product pipelines as described in CSA Z662 Annex E.

Leak detection requirements for gas, multiphase, and water pipeline systems shall be part of the right of way surveillance program.

4.3. Identification & Warning Signs

Pipeline warning signs shall be consistent with the requirements of CSA Z662 and the provincial pipeline regulations.

Facilities Signage

Facility signs shall be used to identify all above ground pipeline facilities, and signs shall be located adjacent to the facility. These facilities include valves, regulator stations, field manifolds, line heaters, metering stations, etc.

For larger facilities such as compressor stations and pump stations, signage containing the following information is required:

- Name of facility, name of operator, and the emergency telephone number.
- A warning symbol identifying the hazard of the above ground facility. The symbol shall be limited to:
    - Category I: Flammable (gas or liquid), or
    - Category II: Poisonous Gas.

4.4. Discontinuance or Abandonment

Inactive pipelines include both temporary short term (0-12 month) and long term (>1 year) pipeline deactivations and permanent pipeline abandonment. A pipeline license amendment is required for pipeline discontinuation (if purged and isolated) and pipeline abandonment.

Pipeline Status Changes details the requirements of the MOC program with respect to pipelines.

Inactive pipelines that are not isolated or not purged are considered operational and all applicable operating and maintenance activities must be maintained. The condition and operational status of such inactive pipelines must be reviewed each year in conjunction with all other operating pipelines.

4.5. Pipeline Reactivation

The resumption of all pipelines inactive for more than 12 months or those with suspect integrity require implementation of the management of change process as described in the *Pipeline Status Changes*.

A pipeline license amendment is required prior to reactivating any discontinued or abandoned pipeline.

A MOC shall be initiated, the datasheet provided in Pipeline Status Change Datasheet optionally completed, and an Engineering Assessment completed prior to reactivation of any pipeline inactive more than 12 months or when the pipeline integrity is suspect.

Pressure testing and other non-destructive testing shall be required if requested by the regulatory jurisdiction or recommended as a result of the engineering assessment.

Each pipeline reactivation requires a corrosion mitigation plan consistent with the site-specific PIP.

4.6. Change in Substance or License Pressure

An MOC shall be initiated, the datasheets shall be completed and an Engineering Assessment completed prior to changing the license substance or service and included in the pipeline file.

An application for consent must be submitted to the AER or OGC, as applicable, to use a pipeline to transport a substance different from the fluid or at a pressure greater than permitted on the license.

4.7. Increase Operating Temperature or Pressure

Changing conditions may cause the normal operating temperature or operating temperature (within MOP) of a pipeline to increase or decrease. While this does not require a license amendment, this change will require an MOC if:

- The change causes the normal operating temperature to increase/decrease by more than 30°C or to a temperature below -30°C or above 60°C, an Engineering Assessment is required to determine if the new conditions are acceptable for pipeline operation, or
- The change causes the normal operating pressure to increase by more than 25%, an Engineering Assessment is required as part of the MOC to ensure the new conditions are acceptable for pipeline operations. This is specifically applicable in the event of pressure increases caused during non-routine operations such as hot oiling, hydrate removal and pig removal.

Fiber-reinforced composite pipelines are restricted to maximum allowable working temperatures depending on the type of composite pipe. Increasing the operating temperature beyond the design temperature requires an Engineering Assessment.

4.8. Tie-in of Additional Gas to a Pipeline System

Increasing gas flow in a pipeline system by the tie-in of new gas or third party gas that will result in a change to the original pipeline design conditions must be initiated by the MOC process. The capacity of pressure relieving devices at the gas destination point, fluid pipeline velocities, gas composition, liquid formation are some parameters, among others, that need to be considered. An Engineering Assessment may be required to support approval of the MOC.

4.9. Intentional Release of Gas

Gas containing greater than 5 ppm H_2S shall not be released from a pipeline intentionally without consent of the AER or the OGC, and incinerated or scrubbed in an approved manner. This is not applicable to gas containing H_2S that is vented from the annulus of a lined pipeline during a quarterly inspection.

De-pressuring and venting pig barrels, pigging valves, or corrosion coupons can only be completed when the system is purged in accordance with AER requirement.

4.10. Engineering Assessments

Engineering assessments of pipeline systems shall be conducted as required to identify the mitigation, monitoring and inspection requirements to maintain pipeline integrity. Pipeline design along with material selection and construction methods as well as operating and maintenance history shall be considered.

Risk analysis is an important part of this assessment; it is a process to evaluate the potential risks and determine the mitigating measures that must be implemented to reduce and control the degree of risk to an acceptable level for any particular hazard associated with the operation of the pipeline system under consideration.

When the required information is not available, inspection and testing shall be conducted to establish the data to allow a proper Engineering Assessment. Examples of this inspection and testing may include in-line testing, test excavations, and pipe cut-outs to establish mechanical properties, etc.

Details of the assessment and the resulting requirements shall be included in the site-specific PIP.

5.0 Maintenance Procedures

5.1. Right-of-Way (ROW) Surveillance

ROW surveillance is a regulated requirement that varies depending on the pipeline product and the Class location. Pipeline ROW surveillance frequencies shall be no less than the requirements detailed in the following Table.

PIPELINE CATEGORY	CLASS 1	CLASS 2	CLASS 3	CLASS 4
HVP (all)	Bi-Weekly	Weekly	Weekly	Weekly
LVP Transmission	Bi-Weekly	Weekly	Weekly	Weekly
LVP Gathering	Monthly	Weekly	Weekly	Weekly
Sour Natural Gas	Annual	Bi-Weekly	Weekly	Weekly
All other pipelines (OE, Water, Natural Gas, Fuel Gas)	Annual or as otherwise defined in the PIP.			

5.2. Regulated Inspections Frequencies

In situations where the ROW is observed on a frequent basis (e.g. lease road that parallels ROW or active farm land) and is in a Class 1 location, visual inspection may be considered to occur every time the ROW is passed. In this case documentation of the inspection need be done by exception only (i.e. generate an IIM upon identification of a substandard condition). This would also require documented training for Operations of the expectation to monitor and report conditions of the ROW, typically as part of a Safety Meeting. In addition, more frequent inspections may be required based upon individual risk assessments in the fields. In either case these exceptions to the above table shall be specified in the site-specific PIP.

Pipeline warning sign inspection, valve and appurtenances inspections and crossing inspections shall be completed annually at a minimum for all pipeline systems. Appendix I provides additional guidance on conducting right of way inspection activities.

5.3. External Pipeline Corrosion Protection

Cathodic protection shall be provided and maintained on all operating, suspended and discontinued pipelines. An annual adjustive survey shall be performed to identify any deficiencies in the cathodic protection system. Deficiencies shall be reported, assessed and if required corrected.

It has been determined that cathodic protection rectifiers shall only be checked annually, during the annual adjustive surveys. More frequent checks have been assessed as being unnecessary given the historically high reliability of the equipment and electrical grid. Where different intervals for rectifier checks or alternate procedures for conducting the annual adjustive survey are deemed appropriate, the recommended procedures and frequencies shall be documented.

Deficiencies identified during the annual adjustive survey shall be defined as those conditions preventing the pipeline (system) from receiving adequate levels of cathodic protection. All deficiencies shall be resolved immediately during the survey by the CP Vendor if feasible, or a remedial action plan shall be documented by the A&OI Specialist and provided to Operations for resolution.

Any other substandard conditions identified during the annual adjustive survey shall be considered recommendations for system optimization. The A&OI Specialist shall review these recommendations and provide Operations a list for suggested follow-up. It is not considered mandatory to complete any of these recommendations.

Visual inspection may be required for risers (soil interface and exposed surface) and developed for each operating location and described in the site specific Pipeline Integrity Plan (PIP). Details of the assessment and the required mitigation and monitoring requirements shall be included in the site specific PIP.

5.4. Stress Corrosion Cracking Management Plan

Stress corrosion cracking is a pipeline failure mode caused by the combined effects of tensile stress, a susceptible pipe material and a detrimental soil-side environment.

Where pipelines have been found to have disbonded or non-functional external coatings and indications of external corrosion, an assessment for stress corrosion cracking shall be made through the use of Magnetic Particle Inspection (MPI) of exposed / corroded pipe. Results of this inspection may be considered applicable to pipelines in similar service within the same gathering system.

Where SCC has been identified on a pipeline, an SCC management plan shall be documented within the gathering system's PIP that address the specific pipeline and any similar service pipelines within the same gathering system.

5.5. Internal Pipeline Corrosion Protection

Pipelines shall be assessed for internal corrosion susceptibility and mitigation, monitoring and inspection programs developed in accordance with the procedures described in *Pipeline Integrity Management Program*. Details of the assessment and the required mitigation and monitoring requirements shall be included in the site-specific PIP.

5.6. Pipeline Repair/Alteration

Pipeline repairs are an engineering function and as such shall be completed in accordance with *Pipeline Identification and Repair*. Repairs shall follow engineered repair procedures in accordance with the current edition of CSA Z662.

Details of the repair including precise locations, pressure test data and AER submissions must also be maintained.

It is worth noting that AER regulations require that when replacing more than 100 m of continuous pipe as part of a pipeline repair, a pipeline amendment is required.

5.7. Ground Disturbance

All ground disturbance activities are to be carried out by qualified personnel in accordance with the *Ground Disturbance* document.

Where an in-service CVE pipeline is exposed, the *Pipeline Excavation Inspection Form* shall be completed and forwarded to the local A&OI Specialist.

5.8. Failure Analysis

The failed section of pipe removed from the pipeline shall undergo a technical analysis to determine or confirm the mechanism of pipeline failure.

All data from this initial inspection work shall be documented. In addition, the following data shall be retained for the life of the pipeline:

- Operating conditions at the site and at the time of the leak/break incident (an estimate of the flowing temperature and pressure, volume throughput, velocity at pipeline conditions).
- An estimate of the gas liquid ratio and the composition of the gas and liquid(s) existing at the leak location.
- A brief report on the internal (if replacing pipe) and external condition of the pipe at the leak location along with a description of any material (corrosion product, wax or other debris) coating the internal wall of the pipe. If unidentifiable, a sample of the material should be sent to a laboratory for analysis.
- A report including the results of any Root-Cause Analyses (RCA's) and comparing the failure to other failures (if any) on the same line shall be prepared.
- If analysis of the data supports the likelihood of future failures, steps/programs to mitigate the failure cause must be implemented. If there is evidence to suggest that other sections of the pipeline may be in jeopardy under current operating conditions, an inspection shall be completed; a pressure test conducted in accordance with CSA Z662 or the maximum operating pressure of the pipeline system shall be reduced to 10% below the pressure at the time of failure.

If the maximum pressure is reduced, an engineering assessment is required to establish the criteria to be used to support continued operation or trigger line abandonment or replacement activities.

Frequent monitoring and semi-annual assessments would be the minimum required to support continued operation of the pipeline in its impaired state. In any case, if there is evidence that a future failure of the pipeline is a possibility, before returning the pipeline to service, a Risk Analysis

shall be carried out to establish the best approach for continued operation and establish a risk level after mitigating measures are implemented. Approval to start-up and continuing to operate would be in accordance with the *Approval Guidelines for Residual Risk Acceptance*.

5.9. Pressure Control, Pressure Limiting, and Pressure Relieving Systems

Pressure control, pressure limiting, or pressure relieving devices shall be installed on pipeline systems in the following applications:

- When two or more pipelines are connected such that one operates at a pressure higher than the other(s).
- When a wellhead is tied directly into a pipeline system and the well has shut-in tubing head pressure (SITHP) greater than the pipeline MOP.
- When it is decided that the pipeline system is to be operated at a pressure less than the MOP.

Pressure control and pressure limiting devices shall be inspected once per calendar year, with a maximum interval of 18 months between inspections. This inspection shall:

- Determine if the pressure control or limiting device is properly installed and is protected from dirt of other conditions that could prevent its proper operation.
- Assess the application in order to determine that the device(s) is/are adequate from the standpoint of capacity and reliability.
- Carry out tests in order to determine that the device(s) is/are in good operating condition and set to function at the correct pressure.
- Documentation of these inspections shall be retained in CVE's *Maintenance Management System* for the life of the pipeline.

Pressure relief devices or pressure safety valves (PSV) for pipeline pressure protection shall be serviced in accordance with the requirements of the *Pressure Safety Valve Servicing* document.

Isolation valves between the pressure relief device and the pipeline shall be car-sealed in accordance with the *Installation and Control of PRV Block Valves* document.

5.10. Pipeline Valves

Pipeline valves are installed to isolate sections of the pipeline in the event of a leak or break. They are installed on either side of environmentally sensitive areas such as rivers, lakes, waterways, major roadways and any other areas where emergency isolation is imperative.

Emergency Shutdown Valves (ESD) and/or check valves are installed on pipelines containing sour gas to limit the release volume to that specified in the pipeline license. ESD's are also used on wellheads to shut in the well in the event of a high-pressure condition in the pipeline or a low-pressure condition resulting from a line break.

ESD's are also used on blended gas streams. In the case of blending gas streams for the purpose of maintaining a lower H_2S content in the final blended stream, an ESD will shut in the higher H_2S stream if the H_2S level rises too high in the blended stream.

- All pipeline valves that might be used during an emergency shall be inspected once per calendar year (AER Directive 066).

- Gate valves and ball valves installed on a pipeline and potentially used for isolation purposes shall be, at least, partially operated. In addition, all valves shall be externally inspected and serviced in accordance with the manufacturer's recommendations or a CVE maintenance procedure. As a minimum, check for loose studs and nuts, apply valve grease if required, and check for leakage at the stem and body seals and flange gaskets.
- All valves shall be inspected to ensure that the pressure rating is correct and is sour service compliant in a pipeline containing H_2S.
- For ESD valves in sour gas pipelines, in addition to the above described testing required for manual valves, the actuator shall be inspected every calendar year and the valve tested by opening and closing the valve using the actuator. The high/low set point settings shall be checked to ensure they match the pipeline design requirements. The actuator also must comply with the following requirements:
    - designed to fail closed,
    - remain closed once the device has closed due to actuation or failure, and
    - require on-site human intervention to reopen.

Records of all pipeline valve inspections shall be retained in the field records system for the life of the pipeline. Each valve file shall include location as well as a report addressing the above information requirements.

5.11. Pressure- and Level-Sensing Devices

Instrumentation devices used for the purpose of activating such things as, but not limited to, emergency shutdown valves on pipelines and wellheads, facility equipment shutdowns, oil well pumping equipment shutdowns, etc. shall be calibrated, as a minimum, on an annual basis.

Records of all pipeline valve inspections shall be retained in field records management system for as long as the shutdown equipment remains in service. This information shall include equipment location and a description of any deficiency found and the corrective action taken.

5.12. Pressure Testing

Pressure testing programs for new pipelines, pipeline additions, pipeline tie-ins and pipeline repairs shall be developed in accordance with Pipeline Pressure Tests.

Prior to pressure testing existing pipelines an engineering assessment shall be carried out to: (CSA Z662 Clause 10.11.5.1)

- Determine whether it can sustain the proposed test pressure, and
- Establish appropriate pressure test limits so that the pressure test will not adversely affect the integrity of the pipeline.

Any leak occurring during a pressure test shall be reported to the AER. All pertinent data surrounding a pressure test must be recorded and made available to the AER upon request.

Pressure tests shall be documented to adequately support the success of the tests. Records of pressure tests that qualify piping for service shall be retained in the pipeline's file throughout its useful life and shall contain at least the following information: (CSA Z662 Clause 8.6.1 and 8.6.2.4)

- Time and date of test,

- Pipe specifications,
- Elevation profile and location of test section where applicable,
- Pressure test medium used,
- Test pressure at lowest elevation,
- Test duration,
- Pressure and temperature recording charts, where applicable,
- Pressure volume chart where applicable, and
- Location of any leaks or failures and description of repair action taken.

6.0 References

Province of Alberta

- Pipeline Act
- Pipeline Rules, Alberta Regulation 91/2005

Alberta Energy Regulator (AER)

- Directive 056: Energy Development Applications and Schedules

BC Oil & Gas Commission (OGC)

- Oil and Gas Activities Act, Pipeline Regulation

Canadian Standards Association (CSA)

- CAN/CSA-Z662-15: Oil and gas pipeline systems

National Energy Board (NEB)

- Onshore Pipeline Regulation

7.0 Terms & Definitions

AER	The regulatory jurisdiction that administers the Alberta Pipeline Act and Regulation for pipelines wholly within the province of Alberta.
Class Location	A geographical area classified according to its approximate population density and other characteristics that are to be considered when designing and pressure testing pipelines to be located in the area as defined by CSA Z662.
ERP	Emergency Response Plan
ESDV/ESD	Emergency Shutdown/Isolation Valve
Engineering Assessment	A documented assessment of the effect of relevant variables on equipment operation using engineering principles.
HVP Pipeline	A pipeline handling hydrocarbon or hydrocarbon mixtures in the liquid or quasi-liquid state with a vapor pressure greater than 110 kPa absolute at 38°C determined using the RVP method.
LVP Pipeline	A pipeline transporting a low vapor pressure (LVP) hydrocarbon in the liquid or quasi-liquid state with a vapor pressure of 110 kPa absolute or less at 38°C determined using the RVP method. An LVP pipeline does not contain multi-phase fluids or oil field water.
Multi-Phase Pipeline	A multi-phase pipeline transports fluid that is a mixture of hydrocarbon gas and liquid that may contain produced water, waxes and other components with an H_2S partial pressure of less than 70 kPa in the gas phase if system pressure is 1400 kPa and greater.
MOC	Management of Change, a structured review of proposed changes to maintain equipment integrity.
Natural Gas Pipeline	A pipeline under AER jurisdiction transporting a gas with an H_2S content not greater than 10 moles per kilomole.
NEB	National Energy Board, the federal regulatory jurisdiction that administers the federal Onshore Pipeline Regulation for interprovincial pipelines.
OGC	BC Oil and Gas Commission, the regulatory jurisdiction that administers the BC Pipeline Act and Regulation for pipelines wholly within the province of British Columbia.
Oil Spill Co-Operatives	An industry group of companies that assists one another in dealing with spills of oil or other liquids.
ROW	Right-of-Way, a surface access provided for the construction, operation and or maintenance of equipment.
Risk Analysis	A process defined by Cenovus Energy HSE, to identify hazards and to estimate the risk to individuals, to a population, to property, or to the environment.
RVP	Reid Vapor Pressure. This is a pressure resulting from a testing method used to determine the vapor pressure of hydrocarbon liquids.
Site-Specific Integrity Plan	Detailed assessment of the pipeline system to identify foreseeable integrity threats and to select applicable control, mitigation, monitoring or inspection plans to minimize or eliminate the impact of the threat.
Sour Natural Gas Pipeline	A gas pipeline under AER jurisdiction transporting gas with an H_2S content of more than 10 moles of H_2S per kilomole of natural gas (1%).
Sour Service	For the purpose of pipeline and pipeline equipment design, sour service is defined by CSA Z662 and depends on the concentration of H_2S, the fluid type and the design pressure.

8.0 Revision Record

1.0	[Previous] Not included in this document but deemed to be a part of it, are the operating procedures developed for each pipeline or pipeline system to deal with the requirements of this document. These procedures are maintained within the Cenovus Energy Deep Basin Competency Management system. [Current] Not included in this document but deemed to be a part of it, are the site-specific operating procedures developed for each pipeline or pipeline system to deal with the requirements of this document.
2.0	General updates to 5.3 & 5.4.

9.0 Appendix I: Pipeline ROW Surveillance

9.1. Purpose

This appendix is intended to provide guidance for personnel conducting right of way surveillance activities.

9.2. Inspection Techniques

The method used to inspect a pipeline right of way will typically be aerial surveillance but may also include, ground vehicle, foot patrol, or visual inspection.

Right of way surveillance includes visual observations with the intent to identify the following:

- **Third Party Activities** - Any actions of a third party on or adjacent to the pipeline ROW that may affect the integrity of the pipeline
- **Geotechnical Events** - Any changes in the ground and soil on the right of way that may affect the integrity of the pipeline or indicate a change in the integrity of the pipeline.
- **Environmental Issues** - Indications of pipeline activities or pipeline integrity problems may have affected the surrounding plant or animal life, or their habitats. Also includes observing changes in the vegetation and animal activities that may affect pipeline integrity.
- **Mechanical and Operational Integrity Concerns** - Direct indications of the condition of the pipeline or of issues that that may affect the operation of the pipeline.
- **Watercourse Crossings** – Any changes to the right of way caused specifically by or that may affect a water course.
- **Road Crossings**

In some cases the right of way surveillance may be combined with other activities such as depth of cover surveys, close spaced cathodic protection surveys, or gas detection surveys.

When choosing the inspection technique consideration must be made:

- to ensure the inspection technique will reasonably minimize the disturbance or damage to surface property,
- that the technique can accurately assess the observations, and
- adequate economics and manpower are available to perform the inspection.

While it is important to conduct a complete inspection over the whole right of way, personnel should pay extra attention to potential high consequence areas. Some examples are:

- Water crossings
- Areas of unstable soil
- Major road crossings
- Areas with specific landowner concerns or that have high public awareness

The following table provides a list of typical surveillance techniques.

TYPE OF INSPECTION	DESCRIPTION	SUGGESTED FOR:
Aerial	100% pipeline is viewed from an aircraft.	ROWs where walk/ride inspection is not practical or too frequent.
Walk / Ride	100% of the pipeline ROW is inspected at ground level via a vehicle or on foot.	ROW's with poor visibility via aerial or lease road observation.
Visual inspection	Pipeline ROW is viewed from the closest lease or roads.	ROW's with good visibility and low consequence pipeline substance.
ADDITIONAL PROCEDURES AS APPLICABLE		
Isolation Valve Survey	Review of all isolation valves to ensure they are operable, and a review.	All manually activated valves that are required to isolate pipelines, and all structures attached to the pipeline except ESD's.
Pipeline Warning Sign Surveillance	Review of the pipeline Warning Signage to ensure they are accurate and undamaged.	All pipeline warning signs at road crossings, water course crossings and pipeline facilities.
Depth of Cover Survey	Pipeline burial depth is determined. Completed in conjunction with Walk/Ride type of inspection.	As determined by PIP.
OPTIONAL AND SPECIAL PROCEDURES		
Gas detection survey	Gas detection equipment is used to determine if a hydrocarbon pipeline is leaking which would be otherwise undetectable.	As determined by PIP. Procedure based on Contractor's documents.
Close Spaced Cathodic Protection Survey	Cathodic protection current loss is measured at short intervals along the pipeline.	As determined by PIP

Table #1: Pipeline ROW Inspection Techniques

10.0 Appendix II: Appendix Y – Sample Site Inspection, Testing, and Monitoring Task Summary

Task	Frequency	Applicable	Person Responsible	Description of Work Required	Documentation	Reference
ROW Inspection (routine aerial or ground patrol)	Annual			Inspect & report surface conditions on/near ROW. Report on construction activity performed by others on/near ROW.	Keep record of inspections or supervision activities and retain for 2 years from date of the record.	AR 91/2005 Part 4
ROW Inspection (non-routine) Any area where construction activity on or close to ROW				Other conditions affecting safety and operations of the pipeline. Ensure activities do not impact the pipeline(s).	Keep record of inspections or supervision activities and retain for 2 years from date of the record.	AR 91/2005 Part 4
Inspect P/L Warning Signs	Annually or at same frequency as ROW inspections.			Ensure all pipelines and facilities are identified as required by regulations. Signage must be inspected for legibility and visibility.	Complete form (form to specify requirements for each type of P/L).	AR/2005 Part 6

Task	Frequency	Applicable	Person Responsible	Description of Work Required	Documentation	Reference
Inspect - Water Crossing - Road, railway, other pipeline, and major utility crossings	Annually			Inspect signage, isolation valves, adequacy of cover, safety and integrity of crossing. Identify unapproved ROW vehicle crossings.	Complete form (form to specify requirements for each type of crossing). Engineering Assessment to review crossing.	AR 91/2005 Part 4
Verification of Pipeline Class	Annually (during ROW inspection) for pipelines subject to changes in population or development growth areas.			Compare original design basis with current situation when changes occur in population density affecting class location. Carry out Engineering Assessment to see if change required.	Records of inspection required for life of P/L Engineering Assessment report.	CSA Z-662 Section 10.7.1.4
Inspect Critical Pipeline Valves & ESDV's	Every calendar year (18 months max.).			General Inspection. Stroke valves. Performance check. Leak test.	Complete valve inspection form at every inspection.	AR 91/2005 Part 4 section 50 CSA Z662 Section 10.6.6
Pressure Switches	Every calendar year (18 months max).			Check high setting. Check low setting.	Complete form.	AR 91/2005 Part 4 section 50 CSA Z662 Section 10.6.6
Pressure Relief and Pressure Safety Valves	Every 5 years			Inspect and service	Service report	CSA Z662 10.6.5.3

Task	Frequency	Applicable	Person Responsible	Description of Work Required	Documentation	Reference
ERP Obligations (Sour P/L, sour multi-phase P/L, HVP pipeline	In accordance with ERP. Tabletop exercise with communications exercise, annually. Major exercise, every 3 yrs.			Annual meeting. Operating conditions (temperature, pressure, composition). Ensure: compliance with design; set back requirements continue to be met. ERP training exercises. Demonstrate effectiveness of ERP procedures.	Attendance sheet from meetings, meeting minutes, record of annual contact with residents, ensure new residents to EPZ added to contact list, Report summaries of activities. Document effectiveness of ERP procedures and plans.	AR/2005 Part 1 section 8, ERCB Directive 071 CSA Z662, Section 10.2.2.4,
Spill Response Contingency Plan Obligations	Annual			Annual training and exercise programs.	Records and report summaries of the training and exercise.	ERCB Directive 71 section 1.4.5
Pipeline Failure Analysis & Mitigation Method Instituted	As required			Investigate leak or break. Determine cause & implement measures to prevent occurrence again from similar cause.	Records documenting pipeline leak/break in detail. Submit report to EUB if requested.	AR 91/2005 Part 8 section 76(d) (e) CSA Z662 Sections 10.2.3 & 10.3.4
Leak Detection Systems (single phase product pipelines, crude and HVP service)	Test annually			Demonstrate continued effectiveness.	Document test and results.	AR 91/2005 Part 2 Section 9 (3), (4) ERCB Directive 56 6.9.3 & 6.10.7.5

Task	Frequency	Applicable	Person Responsible	Description of Work Required	Documentation	Reference
Material Balance (single phase product pipelines, crude and HVP service)	Periodic			Interpret material balance records as specified in Annex E of CSA Z662 if leak trend is established.	Complete documentation in accordance with Annex E of CSA Z662.	CSA Z662 Section 10.2.6
Conduct emergency leak simulation for HVP liquids system	Periodically			Test capabilities for initial response to emergency response.	Complete report and document results.	ERCB Directive 66, Section 57

Task	Frequency	Applicable	Person Responsible	Description of Work Required	Documentation	Reference
External Corrosion						
Conduct annual inspection & test for external corrosion	Annually			Inspect all steel lines in P/L system to test effectiveness of corrosion mitigation methods in accordance with corrosion program. check isolation kits. By means of surveys, verify that cathodic protection system meets criteria selected for protection.	Complete form. Retain record of inspection for 6 years minimum. Submit record to EUB if requested. Complete annual report.	AR 91/2005 Part 4 section 53 ERCB Directive 66 section 52
Verify operation of Cathodic Protection system	Semi - Monthly readings. Periodic functionality tests.			Record rectifier output levels;	Complete table.	CSA Z662 Section 9.2.10.2
Stress Corrosion Cracking examinations	In accordance with site specific integrity plan			External inspection of susceptible pipelines for SCC damage	External inspection report	AR 91/3005 Part 2 section 7(2)
Exposed piping inspections as per the site specific integrity plan				External visual inspection for air-soil interface, riser piping, or exposed crossings.		

Task	Frequency	Applicable	Person Responsible	Description of Work Required	Documentation	Reference
Internal corrosion						
Evaluate requirement for and suitability of internal corrosion mitigation procedures	Annual		A&OI Specialist	Review production characteristics and effectiveness of mitigation program.	Annual report.	AR 91/2005 Part 4 section 54 ERCB Directive 066
Chemical Inhibition	Daily/monthly monitoring		A&OI Specialist	Check injection rate. Install corrosion probes. Corrosion probe analysis.	Records and reports to be maintained.	AR 91/2005 Part 4 section 54 ERCB Directive 066
Inspect pipelines per the site specific integrity plan				Monitor effectiveness of corrosion control programs.	Records and reports shall be maintained for 6 years minimum.	CSA Z662 Section 9.4.2
Monitoring per the site specific integrity plan				UT at selected sites. Shadow shots.	Records and reports to be maintained.	CSA Z662 Section 9.4.3
Pigging or Batching per the site specific integrity plan			A&OI Specialist Operations	Batch chemical to coat pipe internals. Pig to remove corrosive fluids. Pig to improve pipeline performance.	Complete report. Complete report. Log timing and results.	
Smart Pigging per the site specific integrity plan	Site-specific – as required		Designated Technical Authority	Direct third party activities – analyze report data.	Complete report.	

Task	Frequency	Applicable	Person Responsible	Description of Work Required	Documentation	Reference
Ground Disturbance Expose P/L	As required			Inspect exposed section of pipeline.	Record of inspection retain 2 years minimum.	AR 91/2005 Part 5
Auditing	Per CVE Audit Program					
Training	Per CVE Training Program					