Pipeline Crossing Discussion Points document analysis concurrent with the ECC Guideline

AI – input direction

Refer to the uploaded files and provide an analysis of issues defined in the Guideline document that could directly pertain to the issues as outlined in the Discussion Point document. Do not hallucinate, and provide all references or sources for all conclusions. Pay particular attention to issues relating to the Canadian seismic exploration and data acquisition process when working in proximity to pipelines and crossing right of ways and summarize the concerns to be considered when designing a best practice for this activity.

Bottom-line finding

The **Discussion Point** is directionally sound in asking for a **risk-based crossing framework** rather than blanket rig-matting. The **ECC Guideline for Surface Loading Assessment** supports that approach, but it also makes clear that **ground pressure alone is not a sufficient engineering basis** for approving Vibroseis or other seismic equipment crossings. A defensible best practice should evaluate **vehicle load footprint, axle/track loads, depth of cover, soil bearing capacity, rutting potential, crossing angle, number of passes, pipe condition, pipe material, anomalies, bends/fittings, operating stress, and whether vibration or ground disturbance is involved**.

The key nuance: **"no excavation" does not automatically mean "no pipeline crossing controls."** For federally regulated pipelines, operating a vehicle or mobile equipment across a pipeline generally requires the pipeline company's written consent unless it falls within the travelled portion of a highway/public road or a defined agricultural activity exemption. The CER guidance also identifies depth of cover, soil type, ground conditions, pipe composition, static/dynamic loads, operating stresses, GVW, vehicle class, axles, load, tire/ground pressure, and size as factors used to assess whether equipment can safely cross.

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1. Where the Discussion Point aligns with the ECC Guideline

The Discussion Point correctly identifies the need to distinguish **surface crossing** from **ground disturbance** and from **Vibroseis source operations**. It states that the issue is crossing buried infrastructure with LGP vehicles, with no excavation, rutting, or ground disturbance, and that units are "driving only" with no vibration engaged during the crossing. That distinction matters because the ECC Guideline is fundamentally about **surface loading from vehicles/equipment crossing buried pipelines**, not about drilling shot holes or intentionally vibrating directly over pipelines.

The ECC Guideline also supports the Discussion Point's concern that a crossing should be assessed on actual risk. It states that its purpose is to support assessment of vehicle and construction-equipment crossings over buried pipelines outside permanent road and railway crossings, and that induced hoop, longitudinal, and combined stresses are compared to accepted limits to determine whether temporary protective measures are needed. In other words, mats should be a **result of assessment**, not the default reflex.

The Discussion Point's comparison with farm equipment is relevant but incomplete. The ECC Guideline recognizes that agricultural and non-agricultural vehicle crossings both create pipeline integrity

concerns, and it notes that agricultural activity has special regulatory treatment in Canada. However, the agricultural exemption does **not** automatically transfer to seismic acquisition vehicles, because geophysical work is not "agricultural activity." For CER-regulated pipelines, agricultural crossing authorization depends on axle weights and tire pressures being within manufacturer limits and on the crossing point not being subject to a pipeline-company safety notification.

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2. Where the Discussion Point needs strengthening

The Discussion Point relies heavily on **ground pressure**: LGP vehicles under 5 psi, the Sercel Nomad 65 at about 6–7 psi, and agricultural tractors or loaded farm equipment in the 6–12 psi range. Those figures appear in the Discussion Point, but the uploaded ECC Guideline does **not** independently verify those equipment numbers. They should therefore be treated as **proponent-supplied inputs** until supported by OEM specifications, actual operating weights, tire/track contact areas, tire inflation pressures, and configured load distribution.

The ECC Guideline shows why ground pressure alone is not enough. Its surface-loading method uses live load pressure, pipe stress response, soil overburden, internal pressure, thermal stress, impact factors, bedding assumptions, soil modulus, and vehicle load matrices. The Guideline also notes that the critical soil-pressure location is not always intuitively under the heaviest wheel; it can shift depending on depth of cover and footprint geometry. That is directly relevant to Vibroseis fleets because large flotation tires can spread the load, but the resulting pipe stress still depends on cover, soil, pipe geometry, operating pressure, and pass configuration.

The Discussion Point should also clarify that "single pass" must mean **single controlled crossing per unit per crossing location**, not repeated back-and-forth travel by a fleet. The ECC Guideline treats live-load stresses as cyclic and notes that repeated vehicle passes can raise fatigue considerations, especially for girth welds, seam welds, shallow cover, or pipe with imperfections. A best practice should therefore count the number of expected passes by vehicle class, not merely classify the operation as "temporary."

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3. Key ECC Guideline issues that directly affect seismic pipeline crossings

A. The Guideline is useful, but not an industry standard

ECC expressly says the Guideline is voluntary, informational, and not an industry standard; each operator remains responsible for practices suited to its specific pipelines, conditions, and locations. That matters for CAGC-style best practice development: the best practice can propose a common screening framework, but it should not imply that ECC has created a mandatory pass/fail standard or that all pipeline operators must accept the same threshold.

B. Pipeline integrity concern exists even without known historic failures

ECC notes that, based on published investigation reports available to the Guideline, there had not been confirmed pipeline failures attributed solely to induced stress from vehicular crossings over a ROW. However, it also warns that repeated agricultural and non-agricultural crossings, especially where depth of cover has changed over time, present integrity concerns and can contribute to incremental damage

such as circumferential or off-axis cracking and pipe deformation. That supports a balanced message: the risk is usually manageable, but it is not imaginary.

C. Practical assessment criteria create a useful pre-screen

The ECC Guideline's practical criteria are directly relevant for proposed "pre-approved crossing conditions." It says the improved method can be used when, among other things, the pipeline is relatively straight under the crossing, free from anomalies unless a dedicated fitness-for-service assessment is performed, not subject to other outside forces unless included in the analysis, has cover depth of at least 0.6 m, has adequate soil bearing capacity so wheels/tracks do not penetrate the ground surface, and has well-understood soil classification/conditions or conservative weak-soil assumptions.

This is probably the strongest technical anchor for a seismic best practice. A pre-approved LGP crossing should be possible only where those conditions are known or conservatively assumed. Unknown pipe condition, unknown cover, weak/wet soil, bends/fittings, anomalies, or repeated traffic should move the crossing into an engineering-review category.

D. Soil condition and rutting are not side issues

The Discussion Point emphasizes no rutting or ground disturbance. That is essential. The ECC Guideline says soil must have enough bearing capacity to tolerate crossing vehicles without wheel or track penetration. CER guidance adds that ruts 30 cm or deeper in the prescribed area are a ground disturbance and says to contact the pipeline company if soil conditions pose rutting risk. A best practice should require a stop-work trigger for rutting or surface deformation well before it becomes a regulatory problem.

E. Impact factors matter even for low-ground-pressure vehicles

The ECC Guideline explains that live load pressure calculated from the static vehicle load is multiplied by an impact factor to account for dynamic effects of a moving vehicle. Impact factor depends on road/surface roughness, vehicle speed, pavement, cover depth, and soil/pavement mechanical properties. The Guideline notes that a reduced impact factor was recommended for slow-moving equipment with low surface contact pressures, but that is still an engineering assumption, not a blanket exemption.

For seismic Vibroseis crossings, this points to simple operational controls: slow speed, no abrupt braking, no turning on the ROW, cross at a defined location, avoid rough/rutted approaches, and avoid repeated traffic down the ROW. In plain English: do not turn the right-of-way into a rally stage.

F. Vibration must be separated from crossing

The Discussion Point correctly states that during crossings the units are driving only and vibration is not engaged. The ECC Guideline discusses vibratory compactors, not Vibroseis trucks specifically. For a vibratory compactor with vibration on, ECC recommends adding centrifugal force to static drum weight and says vibration assessment is outside the Guideline when detailed fatigue assessment is warranted. This supports a best-practice distinction: **crossing with vibration off** can be assessed as vehicle surface loading; **vibrating near or over a pipeline** should be treated as a separate technical review requiring operator approval, source-point setback controls, and potentially vibration/strain/fatigue assessment.

G. Rig mats are not automatically protective

This is a critical point for the Discussion Point. The ECC Guideline says timber mats, slabs, road plates, and similar tools are common mitigation methods, but PRCI testing found timber mats were not very effective when placed parallel to the pipeline. Mats may reduce stresses when placed perpendicular and sufficiently long, but short mats or mats parallel to the pipe sometimes failed to reduce stresses and in some cases increased them. Road plates were also not very efficient in reducing stress, although they may help prevent erosion and rutting.

This supports the argument against blanket matting. If mats are required, the best practice should require the pipeline operator to identify the purpose: stress reduction, rut prevention, erosion control, or surface protection. The mat design should specify orientation, length, thickness, material, placement/removal method, and whether the mat itself could create additional surface disturbance.

H. Pipe anomalies and bends are major decision points

The ECC Guideline repeatedly limits the basic model to straight pipe without imperfections unless a dedicated FFS assessment is completed. It identifies metal loss, crack-like features, dents, deformation, mechanical damage, and weld imperfections as conditions that can reduce allowable limits. It also recommends more comprehensive FFS assessment where low cover depths or heavy vehicles are involved, and lists data such as ILI/NDE, hydrostatic test history, operating pressure/temperature, pipe material, weld and repair records, soil conditions, and cover depth.

For seismic contractors, this means the operator must own the pipe-integrity input. A geophysical contractor can supply vehicle and field data, but cannot credibly certify whether a particular pipeline segment is anomaly-free.

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4. Regulatory and permitting implications for a Canadian best practice

For federally regulated pipelines, the CER prescribed area is 30 m on each side of the pipeline centreline, and anyone intending to construct facilities, cause ground disturbance in the prescribed area, or operate a vehicle/mobile equipment across a pipeline must inform workers and contractors of their obligations. Ground disturbance and vehicle operation across a pipeline have their own authorization pathways.

For vehicle crossings, CER regulations authorize operation of a vehicle or mobile equipment across a pipeline only if the person obtains the pipeline company's written consent, subject to the agricultural activity exception. Agricultural activity is defined as production of crops and raising animals, including tillage, plowing, disking, harrowing and pasturing, and does not include new buildings or footings/posts. Seismic acquisition is therefore best treated as a non-agricultural activity requiring operator consent.

In Alberta, the AER says that if work is inside the ROW, or within five metres of a pipeline where there is no designated ROW, the party may not proceed without the licensee's written consent; the licensee must locate and mark the pipeline and provide supervisory assistance. AER also says persons conducting ground disturbance should contact the pipeline licensee for approval to cross a pipeline with heavy vehicles or equipment.

In British Columbia, the Pipeline Regulation requires design, construction, operation, maintenance, deactivation, reactivation, and abandonment in accordance with CSA Z662 where applicable, and requires pipelines constructed under agricultural land to have minimum cover of 0.8 m. It also requires pipeline permit holders to maintain damage prevention and integrity management programs, with BC One Call membership and current records for non-above-ground pipelines.

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5. Recommended best-practice structure for seismic operations near pipelines

A defensible best practice should be built around four categories:

Category 1 — Normal LGP surface crossing, low-risk case.
Conditions should include written operator consent, positive pipeline locate, confirmed crossing point, no vibration, no drilling/excavation, no parking on ROW, no travel along ROW, firm/frozen or otherwise competent soil, no rutting, sufficient cover, straight pipe, no known anomalies/bends/fittings under the crossing, slow controlled crossing, and limited pass count. This is where a "no matting required unless operator assessment identifies a need" approach is most defensible.

Category 2 — Engineering review required.
Trigger this where cover is unknown or shallow, soils are wet/weak, rutting is possible, crossing angle is poor, multiple passes are expected, equipment is heavy or unusual, the unit may cross near a bend/fitting, or the pipeline operator cannot confirm anomaly status. This category should require a surface-loading calculation or operator engineering acceptance.

Category 3 — Mitigation required.
Use when assessment shows unacceptable stress, rutting risk, inadequate bearing capacity, known anomalies, low cover, high pass count, or other elevated risk. Mitigation may include mats, slabs, temporary bridge/air bridge, alternate crossing point, reduced equipment loads, snow/ice/frozen-ground controls, reduced passes, or avoidance. Matting should be engineered and oriented correctly; ECC's PRCI-based discussion shows that poorly placed mats can be ineffective or counterproductive.

Category 4 — Prohibited or avoided unless special approval.
Include vibration over or very near the pipeline, shot-hole drilling or any ground disturbance within regulated limits without consent/locate, crossing with active rutting, travel along the ROW, parking/staging on the ROW, unknown pipeline location, unresponsive operator without regulatory resolution, or known integrity threats without FFS acceptance.

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6. Minimum data package for a crossing request

A best practice should require the seismic contractor to provide the pipeline operator with:

1. Equipment list by crossing location: Vibroseis model, support vehicles, tracked units, drills, UTVs, pickups, nodal deployment vehicles.
2. For each vehicle: gross weight, axle loads, tire/track dimensions, inflation pressure, contact area, calculated ground pressure, load matrix if available, speed, turning/braking restrictions, and pass count.

3. Activity type: crossing only, travel parallel to ROW, staging/parking, vibration/source point, drilling/shot hole, line cutting, hand-carried node/geophone placement.
4. Ground condition: frozen/unfrozen, snow/ice cover, moisture, soil type if known, slope, ditch/berm, wetland/peat, rutting risk.
5. Crossing geometry: crossing angle, exact crossing point, route map, approach/departure path, whether crossing is perpendicular or offset.
6. Controls: vibration off while crossing, no source points on ROW unless expressly approved, no blade/grading, no soil displacement, no parking, stop-work criteria for rutting or changed ground conditions.
7. Verification: One-Call ticket, operator locate, written consent, tailgate briefing, signage/flagging, operator representative requirements, post-crossing inspection and record.

The operator should provide or confirm the pipeline-specific inputs: depth of cover, pipe material, OD/wall thickness, grade, pressure/temperature, bend/fitting/anomaly status, coating/CP concerns, pipe condition data, and any restrictions or required mitigation. CER guidance confirms that many of these pipeline-specific factors can only come from the pipeline company.

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7. Concerns to carry into the best-practice design

The strongest best-practice position is not "LGP vehicles never need mats." It is: **LGP seismic vehicles operating under defined, verified, low-risk conditions should not automatically require rig mats; mitigation should be based on documented surface-loading risk.** That wording is safer, technically defensible, and more likely to be accepted by operators.

The best practice should expressly avoid unsupported claims such as "farm equipment crosses here, therefore seismic equipment is automatically safe." The better argument is that agricultural loading provides a useful comparator, but seismic operations are not agricultural activities and may involve different vehicle configuration, pass frequency, crossing geometry, timing, and operational controls.

The best practice should also treat matting as a **tool**, not a talisman. The ECC Guideline provides a solid basis to challenge blanket matting because mats can be unnecessary, ineffective, or even counterproductive if short, parallel to the pipe, or poorly designed. But where shallow cover, weak soils, anomalies, high pass count, or rutting risk exist, engineered mitigation remains appropriate.

Finally, the best practice should separate **vehicle crossing**, **Vibroseis source operation**, and **ground disturbance/explosive drilling**. These are not the same risk pathway. Crossing with vibration off is a surface-loading issue; vibrating near a pipeline introduces dynamic source-energy questions; drilling/shot holes, line cutting with soil disturbance, grading, or rutting may trigger ground-disturbance requirements.