An Adaptive Approach to Impact Assessment: the Peace River Study

Meera Nathwani, Shell Canada Ltd.
Roger Creasey, Shell Canada Ltd.
Ken Foster, AMEC Earth & Environmental

Presentation Outline

- Project description
- IA methodology
- IA results
- Benefits
- Limitations
- Learnings

Boreal Forest of Northern Alberta, Canada

The Peace River Complex

- Variety of production methods tested since 1965
- Project to increase production from 2000 to 2800 m^3/day
- EIA required under the Alberta Environmental Protection and Enhancement Act

In-situ “heavy” oil production involves steam injection and pumping from multiple horizontal wells

Surface steam and production pipelines

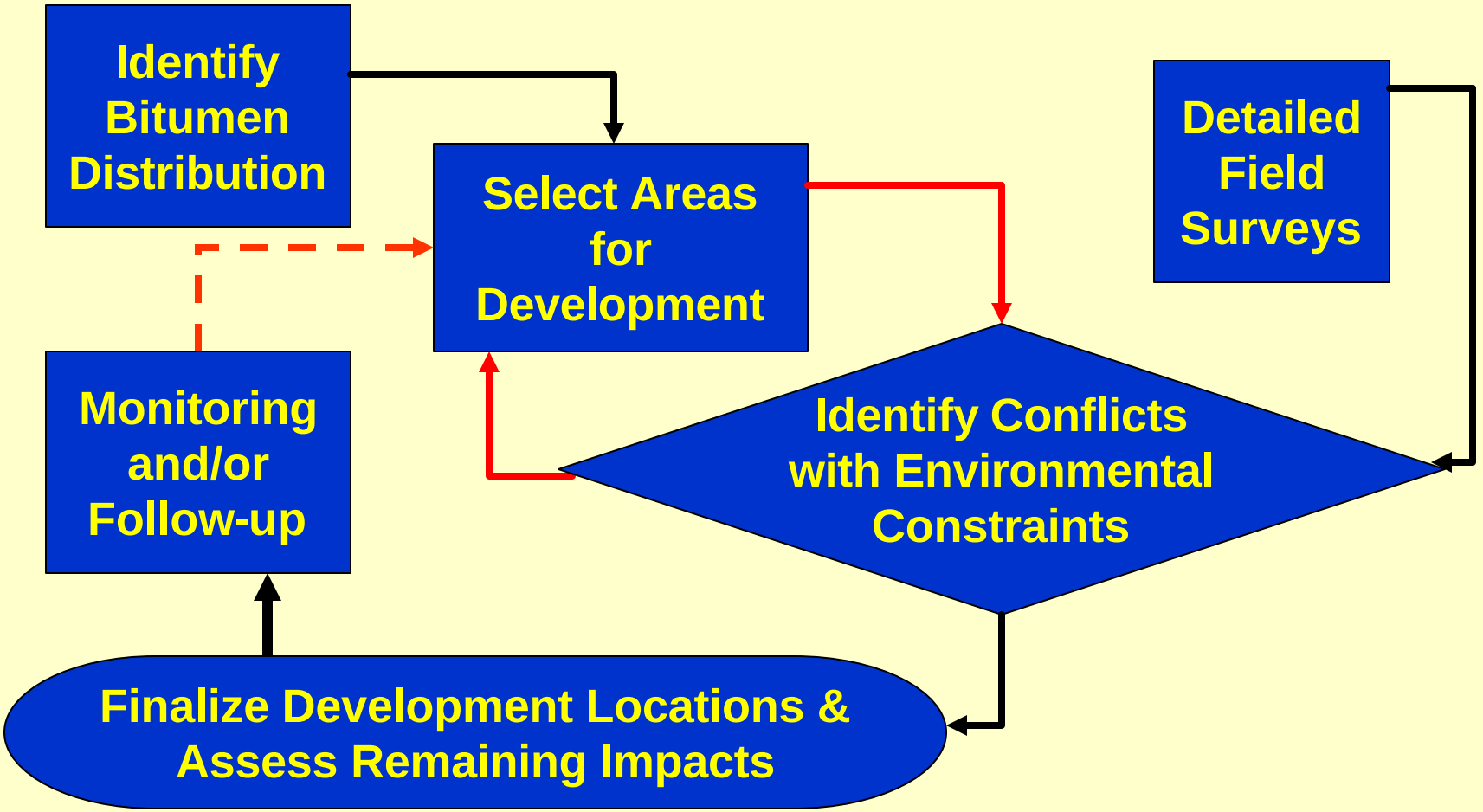
The Project's Neighbours

- Town of Peace River
- Trappers
- Logging companies
- Aboriginal communities
- Other oil and gas companies
- Pulp & paper operators

IA Methodology

- Up to 8 well pads required
- Only first 2 pad locations & corridors to be chosen
- Approval sought for all 8 locations and processing plant retrofit
- IA used as input into project design to minimize environmental impacts
- Baseline field surveys completed to identify environmental constraints to development
- Constraint maps created for vegetation, wildlife, biodiversity, soils, and hydrology

Constraint Approach to Facility Siting & Minimization of Impacts



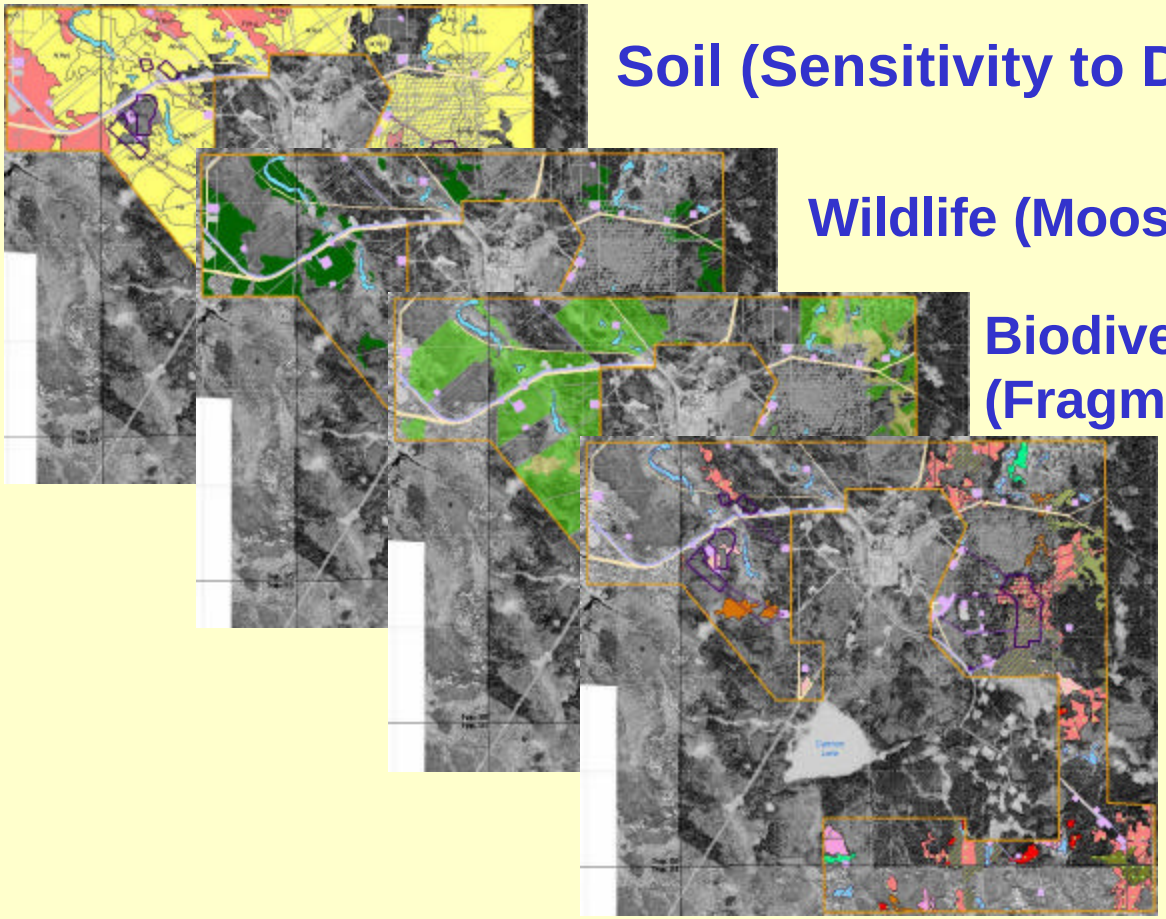
IA Methodology (cont'd)

Impact assessment parameters used to determine sensitivity for constraints maps:

- direction,
- reversibility,
- duration,
- magnitude,
- frequency,
- geographic extent,
- confidence,
- stakeholder input (other land users and regulators), and
- Shell commitments

- Included analysis of interactions between life cycle project activities and environmental components
- Considered mitigation procedures needed to minimize project impacts

Constraint Mapping



Soil (Sensitivity to Disturbance)

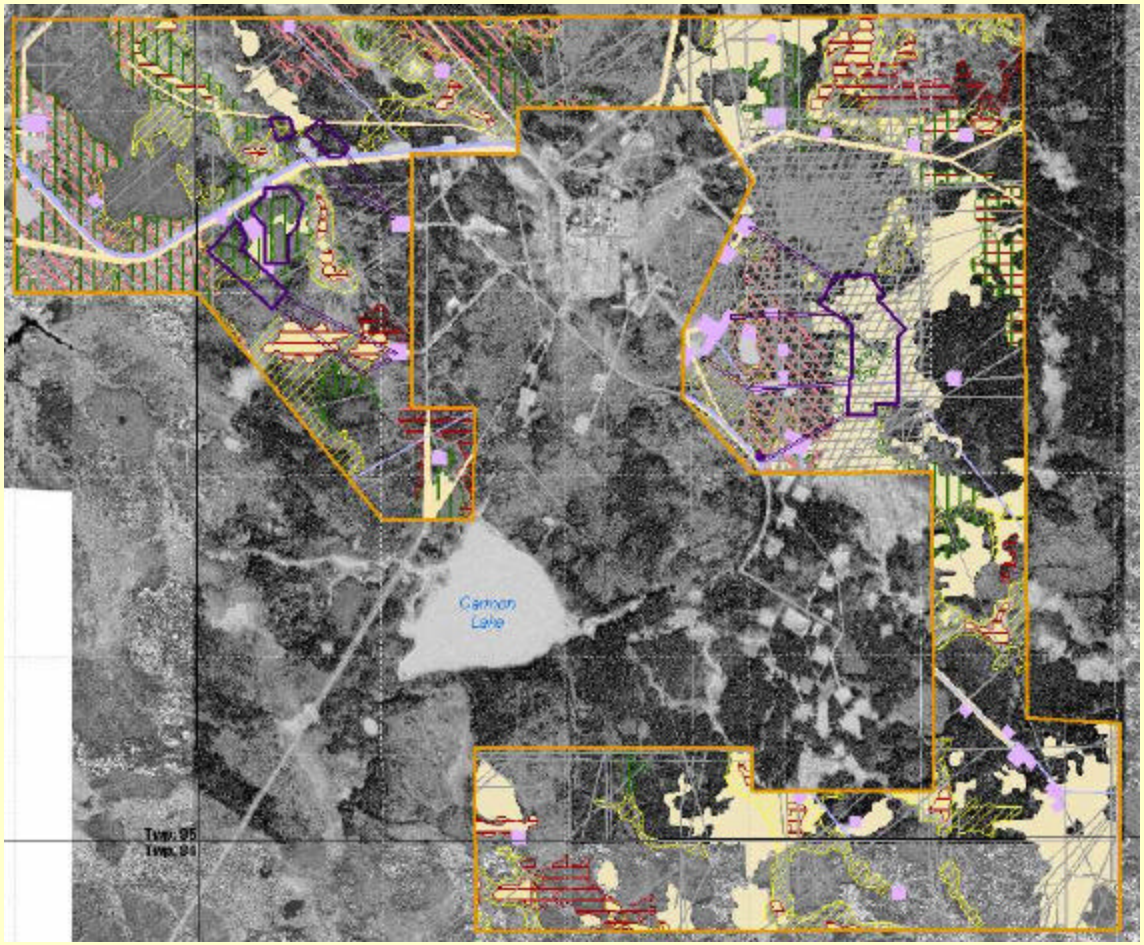
Wildlife (Moose Habitat)

Biodiversity (Fragmentation)

Vegetation (Uncommon vegetation systems)

Final Constraint Map With Development Areas

- Areas ranked according to relative sensitivity to project impacts (L-M-H)



Mitigation Hierarchy

Disturbance footprint modifications made to:

- AVOID - Reduce footprint (use existing disturbance)
- MINIMIZE - Place new disturbance in areas with no constraints
- MITIGATE - Place new disturbance in areas with constraints (from L to H). Develop focused mitigation measures
- Biodiversity, wildlife, vegetation, aquatic resource constraints were given higher priority over soils and hydrology constraints

* Hierarchy consistent with SPE paper no. 86725 by G. Cousins

Finalize Locations

- Complete site-specific surveys for possible development areas to confirm:
  - accuracy of baseline, and
  - presence or absence of environmental constraints
- Assess “maximum potential impacts”
- Finalize engineering design and development layout by balancing resource recovery, economics, and environmental impacts

IA Results

- Project layout results in least risk to the environment and reduced extent of environmental effects, while meeting business needs
- Identification of focused mitigative measures provides basis for site EMS, including reclamation plans

Benefits of Process

- Provides flexibility for uncertain project plans
- Improved project planning and design
  - Increased ability for early integration of environmental information and limitations into project design
  - Early identification of risks and show-stoppers
  - Informed and timely decisions on project go-ahead
- Improved management of environmental issues
  - Pre-mitigation to avoid impacts
  - Constraints used in EMS, with early understanding of effects, guide both development and reclamation
  - Reduced license to operate costs
- True Life-Cycle approach to adaptive

Limitations & Risks

- Communication of project plans without defined project layouts requires additional consultation effort (stakeholder, regulator)
- Is still a little out of phase with the project approval process, and may pose difficulty to regulators until approval process is revised
- Standard EMS procedures need to be revised to incorporate constraints as a planning tool – loss of corporate memory may limit or stop use of constraints to guide development

Learnings

- As an enhancement of an IA approach being developed in Alberta, required close consultation with regulators to ensure study met regulatory requirements
- Be prepared for scope changes as study evolves to meet regulatory requirements, and to adapt to environmental constraints as they are identified
- Documentation of the decision making process is essential
- Consider adaptive IA “training session” for regulatory reviewers

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