OIL SANDS BIRD CONTACT MONITORING PROGRAM

2016 PROTOCOL

Prepared for:

Canadian Natural Resources Limited, Imperial Oil Limited, Shell Canada Energy, Suncor Energy Inc., Syncrude Canada Ltd.

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324 Killdeer Way, Fort McMurray Alberta T9K 0R3 kfoster@owlmoon.ca

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GLOSSARY

Artificial Materials	Man-made structures (e.g., rafts, barges, docks, buildings, deterrents); may be permanent or temporary, floating or fixed, or may form part of a bank. Includes synthetic or other materials used to stabilize slopes
Bank	The engineered or natural outer perimeter of a Liquid Impoundment Facility; slope may be shallow or steep, may be vegetated or non-vegetated. A sparsely vegetated bank would be considered vegetated if it provides sufficient cover to act as an attractant to birds
Bitumen Mat(s)	Floating bitumen
Chick	Young local bird that has not yet developed the ability to fly
Emergent Vegetation	Vegetation rooted in shallow water and can be seen above the water surface; usually found along edges or in shallows in a Liquid Impoundment Facility. Flooded upland vegetation is not emergent vegetation
Flat	Terrain with minimal slope (typically less than 5% or 3 degrees); may be vegetated or non-vegetated (gravel, sand, mud, coke)
Guild, Non-target	Species that peck, fly, glean, stoop/depredate, or scavenge (except gulls) as their primary means of foraging; includes raptors, game birds such as grouse, woodpeckers, and passerines (including ravens)
Guild, Target; or Waterbird	Species that wade, dabble, or dive in water as their primary means of foraging; includes ducks, geese, shorebirds, grebes, loons, cranes, cormorants, swans, pelicans, coots, rails, gulls, terns, herons, and kingfishers
Incidental Observation	An oiled bird, live or dead, detected outside of a formal bird survey or mortality search procedure
Island(s)	A relatively small area of exposed terrain surrounded by water where birds may perch, rest, build nests, or forage. May be vegetated or non-vegetated (gravel, sand, mud, coke); may be permanent or temporary, floating (muskeg mats) or fixed. Does not include floating logs
Liquid Impoundment Facility	A structure, including its banks if present, that holds process-affected water, and may or may not contain bitumen
Migrant	A bird observed once during bird surveys. Birds that cannot be confirmed to be migrants are to be characterized as unknown
Mortality	For the purposes of this monitoring program, includes only oiled dead birds (oiled birds discovered dead, and oiled birds captured and euthanized). Birds that are not oiled and found dead, are reported according to site procedures
OSBCMP	Oil Sands Bird Contact Monitoring Program
Other Habitat Type	Includes ice cover, woody debris, flooded upland vegetation, and any habitat type not previously described
Resident	A bird that is observed in or around the LIF over multiple days; includes adults and chicks. Birds that cannot be confirmed to be residents are to be characterized as unknown
Species of Conservation Concern	Species designated as Endangered, Threatened, or Special Concern under the Canadian *Species at Risk Act*, Committee on the Status of Endangered Wildlife in Canada or the Alberta *Wildlife Act*, or listed within Alberta as At Risk, May Be at Risk, or Sensitive (Appendix A)

Upland	Habitats outside of the perimeter (the bank) of a Liquid Impoundment Facility that are not associated with the Bird Mortality Risk posed by LIF contents; a bird landed on upland habitat is ignored during a bird survey unless it is oiled (live or dead), and recorded as an incidental observation
Waterbird	See “guild, target”

1.0 INTRODUCTION

The Oil Sands Bird Contact Monitoring Program (OSBCMP) was initiated in 2011 in response to heightened awareness of avian mortalities as a consequence of contact with bitumen on water within tailings facilities. Participation in the program by companies with oil sands mining operations is a regulatory requirement, expressed through regulatory approval conditions and/or authorized Bird (or Waterfowl) Protection Plans submitted by operators as part of the *Environmental Protection and Enhancement Act* approval condition(s).

The OSBCMP Protocol (Protocol) was initially designed to detect avian landings, flyovers, and mortalities related to bitumen contact at oil sands liquid impoundment facilities (LIFs[1]). Each year, the Protocol was updated in response to the findings of the preceding year, and to address logistical challenges encountered during monitoring (St. Clair 2012, 2013, 2014; OMEI 2015). This 2016 Protocol is the next iteration, incorporating minor procedural changes based on analyses of the data acquired to date, within the constraints of the logistical challenges associated with working in and around the large and small LIFs at the five mining sites.

As in previous years, the Protocol includes two primary monitoring components, the bird survey and the mortality search, executed at LIFs where the risks of bird contact and/or mortality are highest. These are supplemented with a quick scan procedure applied to LIFs with Low Bird Mortality Risk, and as in previous years, an incidental observation procedure to record oiled bird observations outside of the primary components.

LIF risk is determined through the application of a risk model, the outcome of which determines the allocation of effort to the various types of LIFs at each of the mining sites. Bird surveys and mortality searches are to be conducted at tailings facilities and LIFs at which Bird Mortality Risk is ranked as High.

The program has five objectives that were established at the initiation of the program:

1. Provide an estimate of bird contacts and mortalities on ponds (LIFs) containing process-affected waters.
2. Provide an estimate of bird contacts on ponds containing freshwater.
3. Develop a standardized monitoring program for all oil sands mine operations to provide comparable data across LIFs, sites, seasons, and years.
4. Identify species at risk (species of conservation concern[2]) that have been affected through contact on LIFs containing process-affected waters.
5. Provide direction on adaptive management for long-term monitoring and bird deterrent programs.

[1] The term “liquid impoundment facility” is used in place of “pond”.

[2] The term “species at risk” refers specifically to species categorized at defined population sensitivity levels, not broadly to include all species listed within provincial and federal documents. In 2015, this term is changed to “species of conservation concern” to more broadly encompass species at some level of provincial and/or national concern. Species of conservation concern are listed in Appendix B.

The second objective (to provide an estimate of bird contacts on ponds containing freshwater) was fulfilled from 2011 to 2014, and monitoring of freshwater ponds was discontinued in 2015.

2.0 SCHEDULE OF DELIVERABLES (FIELD PROGRAM)

The schedule of deliverables in Table 1 provides an overview of deliverables, due dates and parties responsible for components of the OSBCMP field programs. The sections that follow provide details associated with each deliverable.

Table 1: Schedule of Deliverables – OSBCMP Field Programs

Deliverable	Date	Responsibility
Provide LIF names, survey station coordinates, electronic tablet identifiers, and names and initials of bird survey personnel to Program Manager	April 10	Site operator or designate
Prepare LIF images, with UTM grids for bird surveyors and mortality searchers	April 16	Site operator or designate
On maps, identify areas where bird may be attracted and where there is an elevated risk of bird mortality	April 16	Site operator or designate
Calculate the distance required for transect-based mortality searches	April 16	Site operator or designate
Identify the number of fixed-radius scans and/or small LIF searches required	April 16	Site operator or designate
Bird surveyors and mortality searchers to have completed pre-season training sessions	April 16	Site operator or designate and Program Manager
Establishment of bird survey stations and delineation of bird survey area boundaries	April 16	Site operator or designate
Survey area habitat characterization	Start of monitoring and every two weeks thereafter	Bird surveyors
Bird surveyors to complete an intra-season IOV based training session	April 16 to July 6	Site operator or designate and Program Manager
Bird surveyors to complete an intra-season IOV based training session	July 25 to October 31	Site operator or designate and Program Manager
Delivery of satellite imagery to the Program Manager	October 31	Site operator or designate

Each survey station is to be given a unique code (a 4 to 10 character string preferred) that will be used consistently through the season. Survey station names should be kept as short as possible to facilitate inclusion of survey station names in maps, tables and data figures.

Each operator is to acquire one high-resolution image of their site each year, showing the LIFs included in the OSBCMP procedures. The image is to be taken at about the same time each year (variances due to cloud cover are acceptable), preferably during June or early July. This image is to be used to define the characteristics of each LIF and survey area, using GIS coupled with ground-based observations.

3.0 HABITAT DEFINITIONS

The definition of the LIF is inclusive of all features within the top of the constructed banks of the LIF. In the absence of an engineered or natural bank (i.e., the landform slopes gradually away from the open water without an obvious bank), the LIF limit is designated to be either at an apparent transition to upland vegetation or 50 m from the edge of open water, whichever is less. While a 50 m delineation of a LIF edge may be considered arbitrary, it is likely that habitat(s) contained within this area will have the most impact on bird landings in the LIF, and it is necessary to delineate a LIF limit and survey area boundaries for the purposes of monitoring and data analyses. Habitats are defined in Table 2 and illustrated in Figure 1. This represents a grouping of some habitats that were separately defined in the 2015 program, and addresses the often artificial or difficult to discern distinctions between similar habitat types within LIFs.

Table 2: Habitat Definitions (2016)

2016 Habitat Type	Habitat Type(s) Included
Open Water	Open Water
Flat/Bank Vegetated	Vegetated Flat
	Vegetated Bank
Island Vegetated	Vegetated Island
Emergent Vegetation	Emergent Vegetation
Flat/Bank Non-vegetated	Gravel, Sand, Mud Flats
	Coke Flat
	Non-vegetated Bank
Island Non-vegetated	Non-vegetated Island
Artificial Materials	Bank constructed of Artificial Materials
	Artificial Structure
Bitumen Mat	Bitumen Mat
Other	Woody debris, flooded upland vegetation, and other habitat types not described above. Must describe in comments section of data entry form

4.0 LIQUID IMPOUNDMENT FACILITY INCLUSION/EXCLUSION CRITERIA AND RISK MODEL

Each LIF at a mine site is to be examined using the following inclusion and exclusion criteria, followed by application of the risk model to examine LIFs that are neither included nor excluded by the criteria. This process will identify the LIFs that are to be included in the OSBCMP bird survey and mortality search programs. Some LIFs excluded from these programs will be included in the quick scan procedure.

New LIFs, and LIFs to which process-affected water becomes a component of the effluent, would be either explicitly included in the OSBCMP (i.e., tailings facilities), or evaluated using the risk model. Evidence of bird mortality due to bitumen content at a LIF would also be cause to re-evaluate the LIF against the exclusion criteria and/or using the risk model in subsequent years.

No changes to the inclusion criteria, exclusion criteria, or risk model have been made for the 2016 program year.

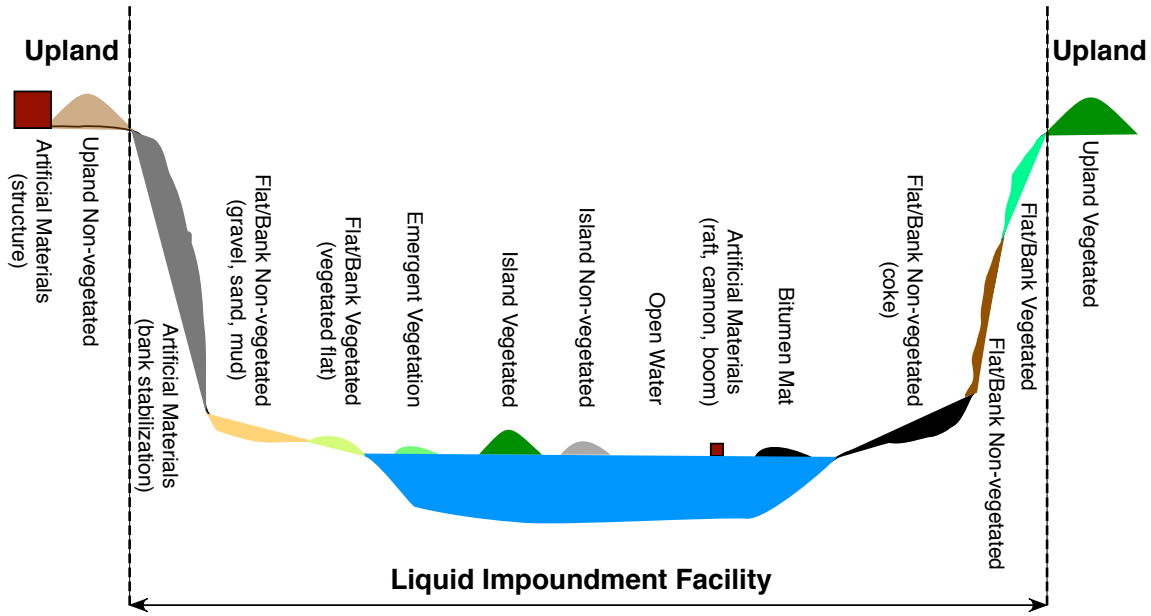

Figure 1: Habitat Components in a Liquid Impoundment Facility (Cross Section; vertically-exaggerated)

4.1 Liquid Impoundment Facility Inclusion and Exclusion Criteria

4.1.1 LIF Inclusion Criteria

Tailings facilities are the primary target of monitoring programs within the OSBCMP, with the majority of landings and bitumen-related mortalities occurring within these facilities. The size of the tailings facilities, their contents (including bitumen), and the bird contact and mortality data collected from 2011 to 2015 justify the inclusion of these facilities in the ongoing OSBCMP monitoring programs. These large facilities were the original target of the monitoring program arising out of the bird landing events in 2008 and 2010.

4.1.2 LIF Exclusion Criteria

The LIF exclusion criteria are presented in Table 3, and will be used in assessing LIF inclusion for the 2016 program. Data acquired from the period of 2013 to 2015 (inclusive) are to be used in the evaluation of LIFs using these criteria, and the results documented. LIFs not explicitly excluded by application of these criteria are to be evaluated using the risk model.

The 2015 bird survey data, normalized to a per survey basis, are to be used to evaluate the LIF against the 2nd criterion (landings of target guild species of ≤0.10 per survey in preceding two years). Following the 2016 season, revision to an area-based normalization (birds per ha) would be appropriate.

Table 3: Small Liquid Impoundment Facility Exclusion Criteria

LIF Characteristics	Exclusion Criteria
Open water area	≤1.5 ha
Target guild landing observations	Landings of target guild species of ≤0.10 per survey in preceding two years
LIF-associated mortalities	Mortalities of ≤1/year due to contact with bitumen in the LIF
Industrial setting	LIF is within 100 m of active industrial operations, staging area(s) and/or roads
Human activity	Daily human presence, observed birds reported per site reporting requirements

4.2 Liquid Impoundment Facility Risk Model

The risk model is to be applied to LIFs not explicitly included or excluded by the above critera. The model operates through a series of steps (Figure 2) to derive a Bird Mortality Risk (High or Low) associated with the LIF. In addition to tailings facilities (included per the criteria above), LIFs rated as having a High Bird Mortality Risk are included in the bird survey and mortality search procedures of the OSBCMP. The application of the risk model to each LIF evaluated is to be documented.

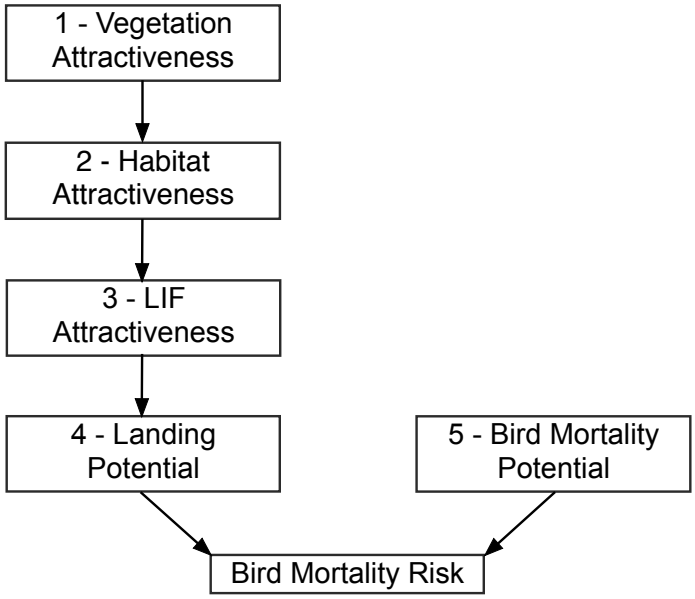

Figure 2: Determination of Bird Mortality Risk using the Oil Sands Bird Contact Monitoring Risk Model

STEP ONE: Vegetation Attractiveness

The presence of vegetation in, on and around the LIF is an attractant to birds. The complexity of vegetated habitats is considered in this step of the model.

Determine if vegetation is present on the perimeter (flats and/or banks) of the LIF, and if vegetated islands and/or emergent vegetation is present. Woody debris, deterrent devices and artificial structures do not constitute islands, and are ignored. These features are then used to derive a Vegetation Attractiveness rating of High, Moderate or Low, using the following matrix:

1 – Vegetation Attractiveness		Vegetated Island &/or Emergent Vegetation in LIF	
		Present	Absent
Vegetated Flat &/or Vegetated Bank	Present	HIGH	HIGH
	Absent	MODERATE	LOW

STEP TWO: Habitat Attractiveness

The presence of flats is an attractant, particularly for species in the wader and gull guilds. Flats may be composed of gravel, sand, mud and/or coke. Non-vegetated islands (exposed sand, rocks or other perching substrates) are also attractants, and may be used as resting areas. Complex flats (varying topography, varying composition) that abut open water and are near to cover are ranked as having a High attractiveness. Large, expansive flats without topographical complexity, composed primarily of a single material, and are not proximal to open water or vegetative cover are ranked as having a Low attractiveness. Flats between these two conditions are rated as having Moderate attractiveness. Characterization of flat complexity and the influences associated with proximity to open water and/or nearby cover requires professional judgment and knowledge of bird habitat preferences.

Using the Vegetation Attractiveness rankings derived in Step One together with the attractiveness ratings for flats, derive a Habitat Attractiveness rating of High, Moderate or Low:

2 – Habitat Attractiveness		Complexity of Non-vegetated Flats &/or Non-vegetated Islands		
		High	Moderate	Low
Vegetation Attractiveness (1)	High	HIGH	HIGH	MODERATE
	Moderate	HIGH	MODERATE	LOW
	Low	MODERATE	LOW	LOW

STEP THREE: LIF Attractiveness

Large areas of open water are an attractant, therefore, the area of open water is included in the evaluation of LIF attractiveness. Open water areas of 5 ha and larger are considered to have a high degree of attractiveness, particularly for divers that require larger ponds for take-off. Open water areas of 1.5 ha or less (a cut-off incorporated from the 2014 OSBCMP Protocol) are less attractive, while open water areas of 1.5 to 5 ha are considered to be moderately attractive. Using the results from the Habitat Attractiveness matrix (Step Two) together with the open water area, derive a LIF Attractiveness rating of High, Moderate or Low, using the following matrix:

3 – LIF Attractiveness		Open Water Area		
		>5 ha	1.5 to 5 ha	≤1.5 ha
Habitat Attractiveness (2)	High	HIGH	HIGH	MODERATE
	Moderate	HIGH	MODERATE	LOW
	Low	MODERATE	LOW	LOW

STEP FOUR: Landing Potential

Although the LIF Attractiveness rating is likely to identify the majority of LIFs that will attract waterbirds, data acquired to date can be used to ensure that LIFs attractive to birds for reasons not considered Steps One to Three are properly evaluated. The landed bird observation data (target guilds) from the preceding two years, for LIFs that have been included in the program, provide the means for this evaluation.

For evaluation of a LIF for which bird survey data are available, the maximum number of landings per survey in the previous two years is to be used. For a LIF with more than one survey station, the survey station with the highest bird landings per survey is to be used. For a LIF not included in the OSBCMP to-date, assign a target guild landings per survey of 0.05 to 1.5 for this step. This assignment results in the Landing Potential being derived on the basis of habitat alone for previously un-monitored LIFs. For this step, the 2015 bird survey data, normalized to a per survey basis, are to be used. Following the 2016 season, an evaluation of the cutoffs using an area-based normalization (birds per ha) from 2015 and 2016 would be appropriate. Using the results from the LIF Attractiveness matrix (Step Three) together with the greater of the number of target guild landings per bird survey from the previous two years, derive the Landing Potential (High, Moderate, Low) for the LIF using the following matrix:

4 – Landing Potential		**Target Guild Landings per Survey (Greater of the Preceding Two Years)**		
		>1.5	**0.05 to 1.5***	**<0.05**
LIF Attractiveness (3)	**High**	HIGH	HIGH	MODERATE
	Moderate	HIGH	MODERATE	LOW
	Low	MODERATE	LOW	LOW

* A LIF not included in the OSBCMP program to-date is assigned this category.

STEP FIVE: Bird Mortality Potential

A Bird Mortality Potential rating is to be derived independently from the LIF Attractiveness rating procedure (Steps One to Four). The Bird Mortality Potential rating is based on two factors: the presence/absence of bitumen in the effluent stream to the LIF, and the observation of a bird mortality (including captured and euthanized birds) associated with the LIF in the preceding two years. Only mortalities that can be associated with contact with bitumen in the LIF are considered in this analysis. Determine if bitumen is or can be present on the LIF surface, and if one or more LIF-related mortalities have been observed in the preceding two years. For each LIF, determine the Bird Mortality Potential rating of High, Moderate or Low, using the following matrix:

5 – Bird Mortality Potential		**Bird Mortality in Past Two Years due to Contact with Bitumen in LIF**	
		Yes	**No**
Surface Bitumen Present	**Yes**	HIGH	MODERATE
	No	HIGH	LOW

STEP SIX: Bird Mortality Risk

A matrix combining the Landing Potential (Step Four) with the Bird Mortality Potential (Step Five) is used to define the Bird Mortality Risk (High or Low) associated with each LIF:

Bird Mortality Risk		Bird Mortality Potential (5)		
		High	**Moderate**	**Low**
Landing Potential (4)	**High**	**High Risk** Bird Survey & Mortality Search	**High Risk** Bird Survey & Mortality Search	**Low Risk** Quick Scan &/or Incidental Observations
	Moderate	**High Risk** Bird Survey & Mortality Search	**High Risk** Bird Survey & Mortality Search	**Low Risk** Quick Scan &/or Incidental Observations
	Low	**High Risk** Bird Survey & Mortality Search	**Low Risk** Quick Scan &/or Incidental Observations	**Low Risk** Quick Scan &/or Incidental Observations

5.0 TRAINING AND PROTOCOL SUPPORT

The Program Manager is responsible for ensuring that training on the procedures in this Protocol is provided to site personnel by April 16. Each operator must ensure that field personnel acquire the appropriate site-level training and orientations necessary to begin monitoring on April 16. Training dates, times, and locations will be determined in consultation with site operators, taking into account crew shift schedules.

Monitoring crews are responsible for knowing how to use the tools required to perform the procedures within this protocol (compass, GPS, range finder, tablets and tablet forms, optics, bird identification guides).

The Program Manager will provide protocol support personnel, who will provide site-level protocol training and procedural oversight through the season. This will replace the training sessions held mid-season, and focus efforts on addressing issues and questions arising in the procedures, and provide guidance on how to execute the procedures when facing unique situations not explicitly covered in this protocol.

6.0 BIRD SURVEYS

6.1 Overview of the Bird Survey Procedure

The bird survey procedure applies to the LIFs determined to have a High Bird Mortality Risk. The purpose of the bird surveys is to document the number and species of birds landed within each survey area, as observed from a ground-based survey station.

Table 4 provides an overview of the 2016 bird survey procedure, and summarizes changes since 2013.

Table 4: Evolution of the Bird Survey Procedures (2013 to 2016)

Item	2013 (St. Clair et al. 2013)	2014 (St. Clair et al. 2014)	2015 (OMEI 2015)	2016
LIF inclusion	Survey all LIFs that were included in previous Protocol	As in 2013, but small LIFs without landings or mortalities surveyed once per week	LIFs defined as having a High Bird Mortality Risk included in the bird survey procedure	As in 2015
LIF characteristics	Describe LIF characteristics for vegetation, islands, beach and bitumen (bitumen cover estimated to nearest quartile), analyses of satellite image by GIS	As in 2013, but conducted four times per year	LIF characteristics described using a satellite image, analysed by GIS coupled with ground-based observations	As in 2015
Number of survey stations per LIF	Open water area ≤150 ha = 1 station 151 to 500 ha = 2 stations 501 to 1,000 ha = 3 stations >1,000 ha = 4 stations, one per quadrant	As in 2013	As in 2014, except quadrant requirement removed for liquid impoundments >1,000 ha	As in 2015
Survey season	Spring and fall monitoring periods: April 16 to July 6, and July 25 to October 31	As in 2013	As in 2014	April 16 to October 31, inclusive (mid-season break eliminated)
Survey schedule	LIFs monitored 7 days per week. Freshwater ponds monitored 2 days (surveys) per week	LIFs of high priority monitored 6 days per week. LIFs of low priority monitored once per week. Freshwater ponds monitored 2 days per week	LIFs with High Bird Mortality Risk monitored 6 days per week	LIFs with High Bird Mortality Risk monitored 3 days per week
Comparison day	None	One day per week selected by each operator, used for training, IOV, missed surveys, data QA/QC	As in 2014, except restriction on selection of comparison day by each operator relaxed	Comparison day eliminated
Survey method	Time-based survey of birds landed and flying over LIFs within the survey area	As in 2013	Ground-based census of birds landed at LIFs within the survey area. No flyover observations	As in 2015
Survey station naming	QR code signs to identify the location of the survey station	As in 2013	As in 2014, however, new QR code signs not required for any new stations	QR codes no longer required. Survey stations to be named using unique codes. Sites to mark survey stations at their discretion
Alternate survey stations	Alternate survey stations were used when the primary station was temporarily inaccessible	As in 2013	Alternate survey stations no longer used. Missed surveys are completed on the comparison day	As in 2015, missed surveys completed on the next available day (only one survey per day per survey station is permitted)

Item	2013 (St. Clair et al. 2013)	2014 (St. Clair et al. 2014)	2015 (OMEI 2015)	2016
Survey area	Survey area includes the water, shore that could be reached at any time of the year by changing water levels, and air below 100 m within a 500 m radius of the survey station	As in 2013	Survey area delineated based on a 500-m radius from the survey station. Habitats within the survey area characterized	As in 2015
Survey duration	Open water area ≤150 ha = 10 min >150 ha = 30 min	As in 2013; use of a stopwatch	Sufficient to confidently identify and count (census) all visible landed birds in the survey area, minimum survey duration of 5 minutes and maximum duration of 30 minutes	As in 2015
Bird inclusion	Include birds that contact the shore area in addition to those landed on water	All species, landed and flying within the survey area. Gulls not considered a target guild (post-season data analyses treated gulls as a target guild). Distinguish between birds as being on water or between current waterline and high water mark and whether that area is wet or dry. High water mark includes any area with visible bitumen or water residue	All landed birds within the survey area. Habitat within which bird landed recorded	As in 2015
Flyovers	Report flyovers that occur within 100 m immediately above survey areas	As in 2013	Flyovers removed from bird survey procedures	As in 2015
Requirements for single observers	Use of voice recorder to avoid looking away from LIF to record data, or a stopwatch to suspend monitoring during data recording	Function on tablet to stop scan clock when single observers are recording data	Monitoring can be completed by single or multiple observers	As in 2015
Bird hazing	Not discussed	Hazing not permitted during a bird survey, only species of conservation concern in imminent danger hazed after survey complete	Hazing permitted at conclusion of survey, immediately if a bird is in imminent danger of bitumen contact. Hazing prior to or during a bird survey invalidates the survey	As in 2015
IOV	U of A visited all sites several times during each of spring and fall	Operator personnel conducted intra-site IOV sessions	IOV procedure incorporated into training program	IOV's removed from protocol
Training	Attendance at U of A webinar	Operator-level Protocol training	Classroom and field sessions for monitoring personnel to understand the Protocol and to minimize observer variability	Program Manager to provide Protocol training prior to April 16, and protocol support through the season

Item	2013 (St. Clair et al. 2013)	2014 (St. Clair et al. 2014)	2015 (OMEI 2015)	2016
Data Submission and Verification	Submit data via electronic forms, paper forms used only on an interim or emergency basis	Where permitted and within site safety requirements, data entered in an electronic form and sent to the server. Data verification on a 2-week cycle. Paper forms used when required by site safety restrictions	Tablet forms for data recording and transmission. Paper forms to be derived by site operators for use when site safety restrictions limit use of electronic devices. Data submission required weekly	As in 2015, except that electronic data recording systems other than tablets may be used, providing data are formatted for integration into the regional dataset

6.2 Survey Stations and Survey Areas

6.2.1 Establishing a Survey Station

Survey station locations are to be selected for best viewing bird activity on the LIF, within site safety and access restrictions. The number of survey stations to be established on a LIF varies with LIF size (Table 5), and is the same as in previous years. For LIFs with multiple stations, stations should maintain a minimum 200-m separation between survey areas.

Table 5: Number of Survey Stations per LIF

Open Water Area (ha)	Number of Survey Stations
≤150	1
151 to 500	2
501 to 1,000	3
>1,000	4

6.2.2 Survey Area Delineation and Habitat Characterization

Each survey station is to be given a unique code (a 4 to 10 character string preferred) that will be used consistently through the season. Survey station names should be kept as short as possible to facilitate inclusion of survey station names in maps, tables and data figures.

Survey stations should be established within 200 m of the bank (or edge) of the LIF, as the survey area shrinks rapidly with increasing distance of the setback beyond 200 m (Figure 3). The survey area is defined as the visible LIF area within a 500-m radius of the survey station. The boundaries of each survey area are to be delineated prior to the start of the monitoring season, and must be held constant throughout the 2016 monitoring program.

Topography may interfere with visibility of some areas that would otherwise be included within the survey area. Examples include a tall bank that shields a portion of the LIF from observers; in this instance, the survey area boundary begins at the point where the survey area comes into view (Figure 4). In this example, habitats included in the survey area include all those within the LIF visible between the survey station and the 500-m radius defining the survey area. The area between the survey limit (the lower sight line) and the top of the nearest bank is not visible to observers, and data on the presence of landed birds in this zone are not to be collected.

In the event that an obstacle blocks visibility to a portion of the survey area, personnel may delineate the survey area in two parts, as illustrated on the left of Figure 3. Although in two parts, this is to be considered a single survey area for bird survey and habitat assessment data collection. Alternatively, survey personnel may walk a short distance to one or both sides of the obstacle to gain visibility, and providing that the boundaries of the survey area are understood and consistently applied, a bird survey conducted across the entire survey area (including the portion behind the obstacle) is a valid survey. Bird survey personnel taking this approach must neither violate site safety requirements (i.e., move into unsafe areas), nor create a disturbance that significantly affects the number of birds in the survey area.

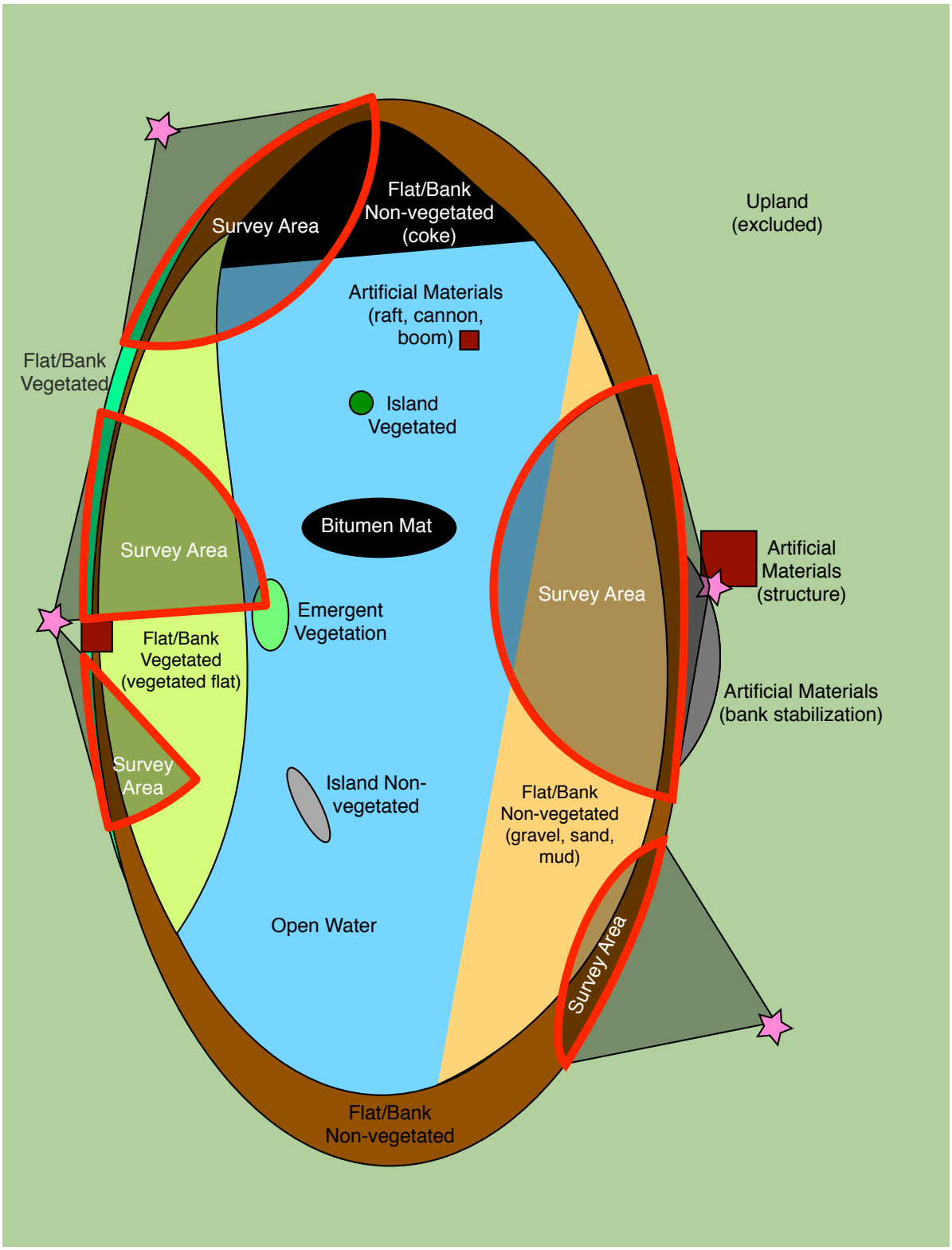

Figure 3: Delineation of Survey Areas
(based on a 500-m radius from the Survey Station)

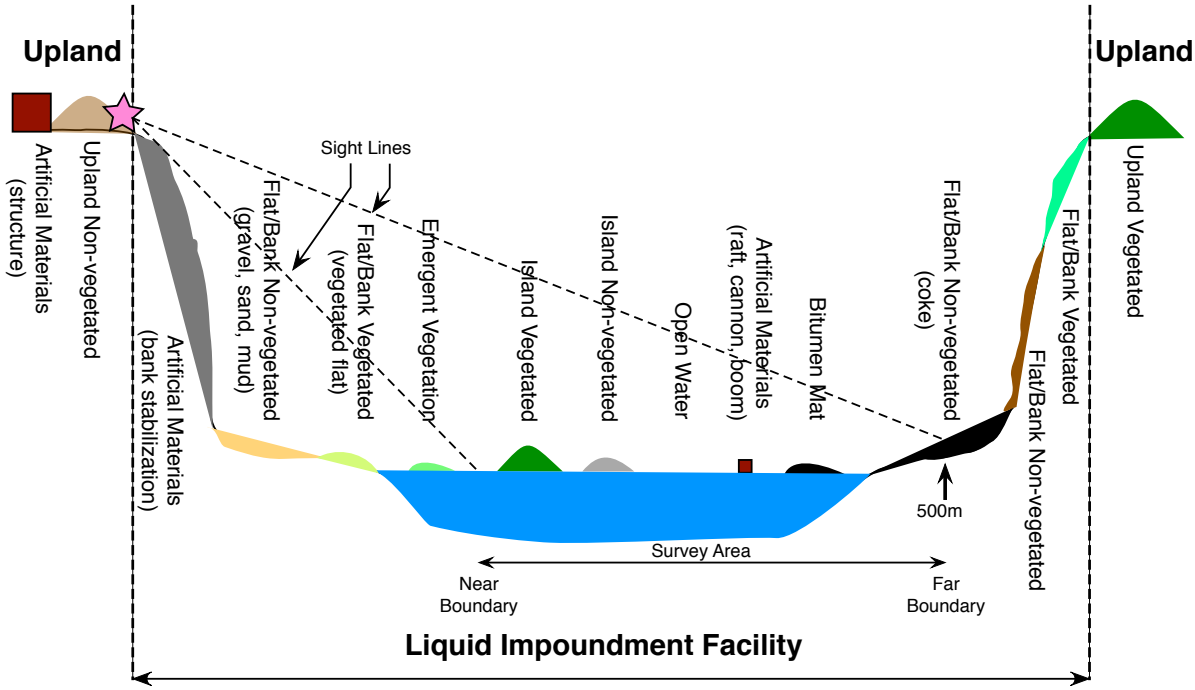

Figure 4: Survey Area Delineation to Accommodate Field of Vision Constraints (cross-section)

The habitat composition within each survey area is to be characterized every two weeks through the spring and fall monitoring seasons. The first habitat composition assessment is to be completed within the first week of monitoring in each of the spring and fall sessions. Habitat assessments should also be conducted on the last day of observations from a station being abandoned (if possible), and on the first day of observations at a new station.

The habitat assessment data requirements are presented in Table 6. Coverage of each habitat type present in the survey area estimated to the nearest percent. These data will provide information on the approximate abundances of the various habitat types within each survey area, and an indication of the variability of these abundances during the monitoring seasons.

Each operator is to acquire one satellite image of each LIF included in the bird survey procedure, per year. The image is to be taken at about the same time each year (variances due to cloud cover are acceptable), preferably during June or early July. This image is to be used to define the characteristics of each LIF and survey area, using GIS coupled with ground-based observations.

Table 6: Habitat Assessment Data Form

LIF Name		
Station Code		
Date		
Surveyed by		
Field of View - Left and Right Compass Bearings		
Distance to Near and Far Survey Area Boundaries	Note if standing at the Near survey area boundary, or if the Near boundary is in front of or behind the observer	
Habitat	**Percent Area[1]**	**Comment**
Open Water		
Flat/Bank Vegetated		
Island Vegetated		
Emergent Vegetation		
Flat/Bank Non-vegetated (includes gravel, sand, mud, coke)		
Island Non-vegetated		
Bitumen Mat		
Artificial Materials (structures, floating or fixed, bank stabilization)		
Other (describe)[2]		
Notes[3]		

Notes:
1 Must total to 100%
2 Must describe other habitats such as ice cover, woody debris and flooded upland in notes
3 Notes providing information on other factors that might affect the presence of birds

6.2.3 Replacement of a Survey Station

If a survey station becomes unsafe, inaccessible, or the survey area becomes irrelevant to monitoring birds, a replacement survey station is to be established, its survey area boundaries delineated, and survey area habitats delineated following the procedures in Section 6.2.1. The replacement station is to be given a new (unique) survey station name or code.

If it becomes necessary to amend the survey area boundaries, a new survey station name or code assigned, even if the survey station itself does not move. The procedures in Section 6.2.1 are to be followed.

6.3 Conducting Bird Surveys

6.3.1 Monitoring Schedule

In 2016, bird surveys are to be conducted from April 16 to October 31, inclusive. The mid-season break, nominally separating the spring and fall migratory periods, has been eliminated.

Monitoring will be conducted at each survey station three times per week, but should not be conducted over three consecutive days. A minimum of one day between surveys at a station should be scheduled. Monitoring at a station on consecutive days should only occur in response to special circumstances, primarily access restrictions.

If a scheduled bird survey is missed, due to temporary lack of access, weather, or other circumstances, it is to be rescheduled for later in the day or for the next available day. An attempted but unsuccessful survey is to be recorded as a missed survey, with comments indicating the reason that the survey could not be completed.

The comparison day has been eliminated from the 2016 protocol, as there are more opportunities during the week to make up for missed surveys. Only one survey per day is permitted, regardless of the number of times a survey has been missed at a station in a week,

6.3.2 Recording Landed Birds

6.3.2.1 Bird Survey Equipment

Each bird survey crew will carry the following survey equipment:

- binoculars (≥10x42 magnification);
- spotting scope (≥60x magnification) of sufficient quality to permit identification of birds at a distance of 500 m;
- tripod (panning head, ≥170 cm tall);
- electronic tablet or equivalent with the bird survey data form;
- notebooks (e.g., Rite-in-the-Rain®) and pencils;
- rangefinder (range of at least 500 m; may be integrated with binoculars);
- handheld GPS; and
- compass (with the magnetic declination set to 14º East in 2015).

Crews may add to this list at their discretion (e.g., bird identification guides).

6.3.2.2 Census-based Survey

One or more observer(s) can conduct a bird survey. Observers may conduct the survey from outside the vehicle, if safe, or inside the vehicle (e.g., strong winds or precipitation hamper detection outside the vehicle) providing that the entire survey area is visible and that the appropriate optics can be properly used from within the vehicle.

All landed birds within the survey area at the time of crew arrival at the survey station are to be counted and identified to the most precise level possible – at a minimum, identification to foraging guild is required (species of conservation concern are listed in Appendix A). Birds flushed from the survey area are to be counted, including those flushed on arrival of the crew at the survey station providing that the habitat(s) from which the birds were flushed can be identified. Birds landing in the survey area while observers are conducting the survey are also to be counted, however, birds landed at the time of crew arrival are to be characterized separately from those landing in the survey area during the survey.

A minimum survey duration of 5 minutes is required. If a large number of birds are present in the survey area, then a crew is to extend the survey beyond the 5-minute minimum time requirement to record and identify all birds. Once all birds are identified and counted, and the 5-minute minimum time requirement is met, the survey is to be concluded. However, if birds are landing continuously and without an obvious break, the census is to stop after 30 minutes.

Birds flying over the survey area at any altitude are not to be recorded.

An interruption during a census (e.g., weather delay, interruption by site activities) invalidates the bird survey, and the data form is to be deleted. The survey is to be rescheduled for later in the day or on the next available day.

Oiled birds are to be characterized according to the extent of oiling – trace, light, moderate, heavy or complete – and reported as required using site-specific procedures. Illustrations describing the levels of oiling are provided in Appendix B.

To better determine the outcome of an oiled bird observation, a greater emphasis on determining the end state of birds observed oiled by bird survey personnel is required in 2016. Within the constraints relating to safety and workflow, bird survey personnel are to determine the outcome of any oiled bird reports they make, and enter the end state (not recovered, recovered, outcome unknown) for those bird(s). This is to identify and address the possible double counting of oiled birds that would occur if each of the bird survey and mortality personnel independently record data on the same bird.

6.3.2.3 Bird Survey Data Form

The bird survey data form is presented in Table 7. As in previous years, electronic tablet forms will be configured and made available to site operators in advance of the initiation of monitoring. A data form is to be completed for each station on each day that a bird survey is scheduled for that LIF. If a survey cannot be completed at a survey station on a scheduled day, the missed survey field must be checked, and the comments field completed to describe the reason for not being able to conduct the survey.

The data form is to be saved on the tablet or equivalent at the completion of the bird survey. Data are to be reviewed and verified for accuracy by the observers before transmission to the database.

6.3.2.4 Hazing

If permitted within site-specific procedures, and it is safe to do so, observers may haze birds once a census is completed. An exception applies to a bird in immediate risk of contacting bitumen – in this instance observers are to immediately haze the bird (if permitted and safe to do so) to minimize the potential for bird oiling and possible mortality. Hazing during the survey invalidates the survey, and if the survey cannot be rescheduled, then notes must be made to indicate that hazing has occurred or is occurring to properly interpret the data.

Table 7: Bird Survey Data Form

Tablet Field	Description
Submission ID	Field generated automatically when data entered into electronic database on the tablet
Operator	Operator Name
Date	Date of Survey
Observer 1	Entered for each observer separately
Observer 2	
Observer 3	
Are you at the Survey Station	Yes or No; if no then a new survey station needs to be established and habitat form filled out, or this is a missed survey
Bird Survey or Missed Survey	Check box for either a bird survey (census) at the survey station, or if the survey station was missed on that day. If missed, the comment field must be completed to describe the reason for the missed survey
LIF Name	A drop down menu will be populated with the relevant LIF names upon entry of the operator field
Survey Station	The unique code assigned to each Survey Station
UTM Easting	Location of observation if barcode not scanned. A 6-digit entry is required
UTM Northing	Location of observation if barcode not scanned. A 7-digit entry is required
Percent Open Water (within Survey Area)	The amount of Open Water (includes floating bitumen mat area; excludes areas of emergent vegetation) within the Survey Area is estimated to the nearest percent
Start Time	Enter times in hh:mm:ss format (24-hour clock). Minimum survey time is 5 minutes
End Time	
Birds Observed	Yes or No; allows tracking of survey effort when no birds are observed
New Migrant, Migrant Seen Previously, or Resident	New Migrant, Migrant Seen Previously, Resident (with chicks or seen often), or Unknown – determined by bird behaviour, date of observations, presence of young birds, and occasionally by species; Residents are best identified from territorial or nesting behaviour and are most likely from mid-May to end-July, but can occur earlier or later depending on species
Species or Group	Species name, or if species unknown then group name (i.e. UNK_GREBE, UNK_DUCK, UNK_DABBLER, etc.); all birds that land are to be recorded regardless of guild; a new entry will be created for each landed bird group. A bird group is defined as a group of birds that all share the same information such as migrant or resident, same species, landed at start, substrate where landed, and oiling level. If one or more of these characteristics differ, a new entry must be made for the bird(s)
Guild	Field populated automatically when data entered into Species or Group (i.e. Dabbler, Diver, Wader, Gull, Scavenger, Other)
Was the Bird(s) Present when the Survey Started	Yes or No
Did you see the Bird(s) Land after the Survey Started	Yes or No. Used to identify which birds fly into the survey area and land during the census

Tablet Field	Description
Substrate Where Bird Landed	Open Water, Flat/Bank Vegetated, Emergent Vegetation, Island Vegetated, Flat/Bank Non-vegetated, Island Non-vegetated, Bitumen Mat, Artificial Structure or Materials, Other (Other should be used if substrate is woody debris or flooded upland, comments are required)
Number of Adults and Flight-capable Juveniles	The number of flight-capable landed birds of each species or species group
Number of Chicks	This field is only used when young birds that are incapable of flight are present; otherwise this field will remain blank
Number of Oiled Birds	The number of oiled birds including adults and young birds of each species or group
Bird Oiling Level	Trace: (<5%) small spots, bird apparently unaffected
	Light: (6 to 20%) oiling around top of legs, small spots or fine streaks on breast, head, or side; bird still capable of sustained flight
	Moderate: (21 to 40%) including the belly, and some of the breast or vent; bird exhibits excessive preening, dunking in water, or other unusual behaviour; sustained flight likely compromised
	Heavy: (>40%) including the breast, belly, and maybe the face; the bird is incapable of flight or easily captured
	Complete: completely oiled
Bird End State	Not Recovered, Recovered, Unknown
Surface Bitumen Present	None, Floating, Waterline, Ground, Objects; floating bitumen may be observed on open water and away from shore, bitumen can also be found along the edge of the water or Waterline, and on the Ground away from the water, and/or on Objects (e.g., boom, container, woody debris)
Surface Bitumen Amount (% of Survey Area)	None: 0%
	Very Low: 1 to 10%
	Low: 11 to 25%
	Moderate: 26 to 50%
	High: 51 to 75%
	Very High: 76 to 100%
Survey Area Visibility	Good: the survey area is clearly observed
	Partially Reduced: heat shimmer, light precipitation or wind, and sun glare reduce visibility; all birds within the survey area can be confidently counted, some identifications may be compromised
	Significantly Reduced: heavy precipitation, large waves, dense steam, smoke, or fog causing some birds in the survey area to not be seen. If this option is chosen, then comments are required to indicate the visible distance
Activity Affecting Bird Numbers in the Survey Area	Operations, Traffic, Construction, Intermittent Noise, Deterrent Activation, Deterrents Have Moved, Deterrents are being Maintained, Hazing Before Survey, Hazing During Survey; subjective judgement based on the activities near or in a survey area that will affect the number of birds landed, more than one activity can be entered
Comments	Comments about constraints affecting the ability to conduct a survey at a station; describe why a LIF or station was not surveyed as scheduled; significant visibility restrictions and visible distance; other observations at discretion of survey crew

7.0 MORTALITY SEARCHES

7.1 Overview of the Mortality Search Procedure

The mortality search component of the Protocol applies to the LIFs determined to have a High Bird Mortality Risk.

Migrant and resident waterbirds are at risk of bitumen contact, and hence mortalities may occur anytime during non-frozen water conditions. As in previous years, the 2016 mortality search schedule is based on the typical open water season, from April 16 to October 31, inclusive. Mortality searches are recommended following severe weather, particularly after days when a sudden decrease in temperature, freezing rain, and heavy fog occur in combination. Mortality searches can be conducted at any time during daylight hours.

Three types of searches are included in the mortality search procedure: (1) transect searches conducted either concurrently with other activities or targeting areas where bitumen accumulates and/or bird mortalities have been observed previously (2) fixed-radius scans of areas where transect methods are not appropriate and where bird oiling and mortality risks are higher, in preferred habitats where birds are known to accumulate, along booms, near outflow pipes, and/or areas that may not be amenable to transect search methods, and (3) small LIFs where scans of the entire LIF surface can be completed. Although few oiled, live and dead birds are found during fixed-radius scan and small LIF searches, these procedures are valuable in performing a mortality search when it is not possible to conduct a transect search.

Oiled, live and dead birds located outside of formal search procedures are to be recorded as incidental observations.

The evolution of the mortality search procedures is presented in Table 8.

7.2 Mortality Search Types

Three types of mortality searches may be conducted: (1) transect searches, (2) fixed-radius scans, and (3) small LIF searches. All three include recording of effort, measured by the area searched within which dead birds can be confidently identified. Transect searches are preferred, however, fixed-radius scans and/or small LIF searches may be conducted at LIFs where it is not possible to conduct a transect search.

Mortalities may be discovered as part of site operations unrelated to the OSBCMP procedures. Personnel receiving information on these discoveries are to gather and record these incidental observations using the appropriate data form.

7.2.1 Transect Search

Bird mortalities are often found during deterrent maintenance and bird hazing activities. The transect method is designed to capture as much effort as possible during the majority of on-pond activities associated with the discovery of oiled, live and dead birds.

Table 8: Evolution of the Mortality Search Procedures (2013 to 2016)

Item	2013 (St. Clair et al. 2013)	2014 (St. Clair et al. 2014)	2015 (OMEI 2015)	2016
Mortality data forms	Recorded mortalities in a separate database via computer following collection of field notes	Forms for each search type; homogenized the provincial and Protocol requirements	Standardized forms to be used to record mortality observations and live oiled bird observations, and the search effort associated with each	As in 2015
Search timing	Conduct mortality searches during spring and fall migration periods (April 16 to July 6 and July 25 to October 31). Mortality searches can be conducted at any time during the day	As in 2013	Mortality searches from April 16 to October 31, inclusive. Mortality searches can be conducted at any time during the day	As in 2015
Frequency	Visit each designated mortality transect at each LIF once every two weeks, and at the operator's discretion	As in 2013	Each LIF with a High Bird Mortality Risk is to be searched once in every 10-day period during the monitoring season	As in 2015
Methods	Combination of route-based and focused searches	Combination of route-based and focused searches with increased emphasis on standardization	Combination of transects, fixed-radius scans and small LIF searches at LIFs with High Bird Mortality Risk, with increased emphasis on recording search effort	As in 2015
Data submission	Submitted data only via tablets or web-based forms; recommended use of paper data forms only on an interim or emergency basis	Recommended data entry in real time to support measurement of search time; entered data transmitted to the data manager in a separate step	Data to be submitted electronically, at a minimum weekly	As in 2015
Data QA/QC	University of Alberta error-checked data weekly and sent requests to operators	Designated an entity to ensure data QA/QC occurred frequently (ideally weekly)	Daily data QA/QC, and at a minimum, weekly submission of electronic data to data manager. Data returned to crew for QA/QC at 2-week intervals	As in 2015
Mortalities per unit of effort	Mortalities per km searched per LIF per year	Mortalities per km searched, per area searched, and/or per hour searched, per LIF per year	Mortalities per ha per LIF per year, by habitat type to the extent permitted by the data	As in 2015
Reporting	Operators wrote reports for their site; the University of Alberta compiled a report for comparison across sites	Recommended comparison of data across operators with compiled data and figures for analysis	Data submitted to Program Manager for compilation and regional reporting	As in 2015

All travel by boat can be considered a transect, and providing speed of travel permits reliable identification of an oiled, live or dead bird within an estimated distance to each side of the boat, the transect may be considered a mortality search. Thus, crews conducting deterrent maintenance, hazing, bird capture and other watercraft-based activities may conduct valid mortality searches as a component of their activities, providing that distance travelled and effective search width is recorded, and crews conduct an effective search of the defined area.

To conduct a valid transect search, both distance travelled and a visible strip width must be recorded. Visibility during transect searches is influenced by weather conditions, wave action, terrain and vegetation, and other view obstructions, and these must be considered in defining the visible, searched strip width. A maximum visible strip width of 50 m (25 m either side of a transect) on open water is the most reasonable distance in which an oiled dead bird can confidently be seen (OMEI 2016), and shorter distances may be applied. Oiled live birds can be observed at further distances, but the effort calculations are limited to the ability to located oiled dead birds. Transects conducted in vegetated habitats are expected to have reduced visibility, often as low as a few metres.

Shore-based transects conducted on foot or by ATV (i.e., around the perimeter of a LIF) are valid, and contribute to meeting mortality search target distances (see below). Because few avian mortalities can be reliably detected from within a truck, and definition of a visible search width is difficult, mortalities observed from a truck are to be recorded as incidental observations without information on search effort.

It is preferable to use hand-held GPS units to record transects conducted as mortality searches, however, GPS units may not be permitted at all LIFs. For those LIFs at which GPS units (or equivalent) cannot be used, images of LIFs with UTM grids (at 50 m to 500 m intervals, depending on LIF size) are to be prepared (by April 16) for use by the mortality search crews. Information necessary for the crew (docks, LIF and open water access points, effluent outfall structures, booms) and areas to be targeted during mortality searches, including areas that potentially contain bitumen, is to be shown on the LIF images.

Habitat will be described within the search area (open water, bitumen mats, flats/banks, etc.), and the percent of each habitat type will be estimated.

7.2.2 Fixed-Radius Scan

Fixed-radius scans are to be used when access precludes the ability to search an area by the transect method. Fixed-radius scan locations will target areas where bitumen is known to accumulate and areas with habitats attractive to birds, and be chosen to maximize visibility. Locations where vegetation is present, bitumen accumulates, or birds are routinely present are candidates for locations for fixed-radius scans. Areas identified through the season as High risk of bird mortality should also be searched. Preliminary locations from which fixed-radius scans are to be conducted are to be identified by April 16, the start of monitoring, and can be adjusted as appropriate through the season.

A fixed-radius scan is conducted from a single location (UTM coordinates recorded, or estimated by map grid coordinates), with the search radius fixed as the maximum distance within which an oiled dead bird can be reliably detected. The searchable area will be measured conducted using a compass and rangefinder. Two compass bearings will be taken, one each representing the left side and right side limits of the field of view (Figure 5). The angle of the view (the fixed-radius) and area searched will be derived from these bearings during data processing.

Habitat will be described within the search area (open water, bitumen mats, flats/banks, etc.), and the percent of each habitat type will be estimated. Vegetated habitats are to be included, however, the effective distance in which a dead bird can be seen is significantly reduced in these habitats, unless the vegetation is sufficiently sparse to see through the foliage to the ground. Mortality searches conducted using a fixed-radius scan will document obstructions and other limitations that may prevent a dead bird from being discovered at the time of the search.

7.2.3 Small LIF Searches

The small LIF search method may be used when access precludes the ability to search a LIF by the transect method. This method is only appropriate when the entire LIF may be searched from one or a few locations, and searchers are confident that they are able to identify dead, oiled birds anywhere in the LIF. If the LIF is too large to allow this requirement to be met, the small LIF procedure is not appropriate, and one or more fixed-radius scans should be conducted instead.

No survey effort information is recorded, as the area of the LIF will be known from image analysis by GIS, or other in-field measurements.

7.3 Mortality Search Effort

The following is provided for guidance to operators in designing their mortality search effort on LIFs having a High Bird Mortality Risk. In every 10-day period beginning on April 16:

- transect searches conducted by watercraft are to cover 15% of the total open water area of each tailings facility and large LIF, using the open water areas reported in the 2015 OSBCMP Regional Report. A visible search width of 50 m (25 m on each side of the watercraft, based on distance of detections of deceased birds from moving watercraft (OMEI 2016) is to be used to calculate the distance to be searched;
- fixed-radius scans conducted where transects are not possible. Based on distances recorded in 2015, heavily oiled birds could be seen from a fixed location at distances of about 15 m, and this limitation must be recognized by survey personnel such that the search distances are not inappropriately overestimated. Fixed-radius scans should be conducted from a number of observation points, separated by a minimum of 50 m, along the LIF edge; and/or
- complete area search of small LIFs, where transect searches cannot be conducted.

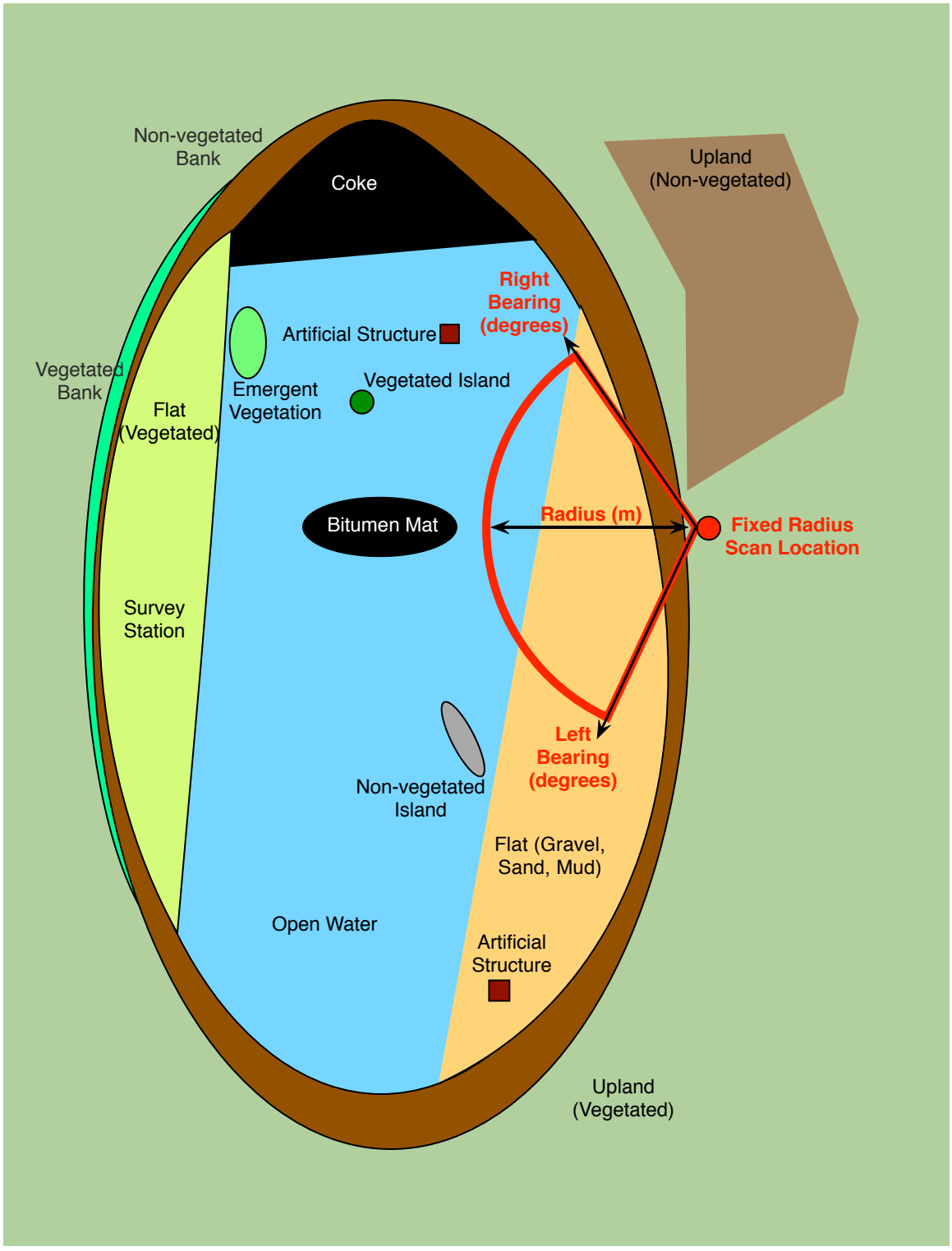

Figure 5: Fixed-radius Mortality Search Delineation

Quantifying the distance at which dead birds are detected is a goal of the mortality search program. For this reason, it is critical that upon confirmation that a detected object is an oiled live bird or mortality, the crew immediately measures or estimates the distance to the bird, preferably using a rangefinder, regardless of whether the bird is within or outside of the defined search area (no adjustment to the search area is necessary). This detection distance will be used in evaluations of detectability, supporting Protocol evolution and the ability to achieve program objectives.

7.4 Data Collection

Consistent recording of search effort is critical to data analysis and interpretation. Recording search effort is especially important when no oiled dead birds are found because these records contribute to the analysis of the number of birds found per unit area searched.

Data will be entered on mortality search forms (Table 9) using electronic tablets, their equivalent, or on paper for later entry into the mortality database. Incidental observations of oiled, live and dead birds, those which cannot be associated with search effort, are to be entered into a separate form. Data are to be submitted electronically, preferably by the end of the daily work shift but at a minimum of every week.

Crews assigned mortality search responsibilities will carry the following equipment:

- binoculars (10x42 magnification or greater);
- compass;
- tablet for data entry or clip board with paper data sheets; and
- hand-held GPS (or equivalent) or laminated map with UTM grid (if map, then include erasable marker).

A rangefinder (range of at least 500 m; may be integrated with binoculars) is recommended for use by mortality search crews, however, alternate distance measurements are permitted (e.g., two GPS points from which distance can be derived).

Oiled birds are to be characterized according to the extent of oiling – light, moderate, heavy or complete – and reported as required using site-specific procedures. Illustrations describing the levels of oiling are provided in Appendix B.

To better determine the outcome of an oiled bird observation, a greater emphasis on determining the end state of birds observed oiled by other personnel is required in 2016. Within the constraints relating to safety and workflow, mortality search personnel are to determine whether or not observed birds, including those captured, have also been entered into other data forms (e.g., bird survey). Both teams are to work towards ensuring that their respective datasets are complete, that notes are made reflecting that the bird(s) have been recorded in other database(s), and that the bird end state is consistently entered. This is to identify and address the possible double counting of oiled birds that would occur if each of the mortality search and bird survey personnel independently entered data on the same bird.

Table 9: Mortality Search Data Form

Tablet Field	Description
Submission ID	Field generated automatically when data entered into electronic database on the tablet
Operator	Operator name
Date	Date of Search
Searcher 1	Entered for each searcher separately as a source of information if there are questions on data
Searcher 2	
Searcher 3	
LIF Name	Consistent with site LIF Name; a list of LIF names is to be provided by the site operator to populate a drop down menu
Activity During Search	Designated Search, Maintenance, Bird Hazing, Other (comments required)
Type of Search	Transect, Fixed-radius, or Small LIF
Percent of Habitat in Search Area	Open Water, Flat/Bank Vegetated, Emergent Vegetation, Island Vegetated, Flat/Bank Non-vegetated, Island Non-vegetated, Bitumen Mat, Artificial Materials (including structures), Other (includes woody debris and flooded upland, comments required). Should add to 100%
Start time	Start time of search in hh:mm:ss format (24-hour clock)
End time	End time of search (hh:mm:ss format; 24-hour clock); interruption in a search should be described in the comments
To Be Completed for a Transect Search	
Search Method	Walking, Boat, ATV, Other (comments required)
Search Start UTM Easting	Starting location of Transect
Search Start UTM Northing	
Search End UTM Easting	Ending location of Transect
Search End UTM Northing	
GPS Track File Name	File name of GPS track of Transect (optional if distance is calculated or estimated and entered into the tablet)
Distance (m)	Distance travelled on a Transect; calculated from a GPS or estimated from a UTM grid on a map
Was Distance Estimated or Calculated?	Estimated or Calculated distance of a Transect; estimates can be used if determined from a UTM grid on a map and will be reflected in a lower level of confidence in the analyzed data
Visible Distance Left (m)	Distance to left side of transect with good visibility and within which a dead bird can be reliably detected, will be within meters of either side of a transect and can be estimated if within 25 m
Visible Distance Right (m)	Distance to right side of transect with good visibility and within which a dead bird can be reliably detected, will be within meters of either side of a transect and can be estimated if within 25 m
To Be Completed for a Fixed-radius Scan	
Search Location UTM Easting	Point location of Fixed-radius scan
Search Location UTM Northing	
Visible Range Fixed-radius (m)	Effective distance of observation with good visibility and within which a dead bird can be reliably detected; distance can be estimated if less than 25 m and will be measured by a range finder if distance is further
Left Bearing Fixed-radius Scan	The left compass bearing best representative of the visible search area as measured from a stationary observation point
Right Bearing Fixed-radius Scan	The right compass bearing best representative of the visible search area as measured from a stationary observation point

To Be Completed for a Small LIF	
Search Location UTM Easting	Location of Search
Search Location UTM Northing	
To Be Completed for all Birds Found During a Search	
Bird(s) Found	Yes or No; allows tracking of search effort when no birds are found
Species or Group	Species name, or if species unknown then group name (i.e. UNK_GREBE, UNK_DUCK, etc.). A bird group is defined as a group of birds that all share the same information such as migrant or resident, same species, landed at start, substrate where landed, and oiling level. If one or more of these characteristics differ, a new entry must be made for the bird(s)
Guild	Field populated automatically when data entered into Species or Group (i.e. Dabbler, Diver, Wader, Gull, Scavenger, Other (comments required))
Number of Birds	Enter the number of oiled live or dead birds found, does not include bird mortalities unrelated to bitumen contact
Time Bird(s) was Found	Time a bird was first found
Where Was Bird Found	Description of the area or substrate where the bird was found; for example, can be habitat (i.e. open water, bitumen mat, flat/bank vegetated or non-vegetated, etc.), or can be more specific to the location, such as a boat launch or other recognizable feature
Distance from Observer to Bird (m)	From point where the bird was first observed; can be visually estimated or estimated from a UTM grid on a map, or measured by a range finder
Bird UTM Easting	Location of the bird where it was first observed; can be estimated from UTM grid on map
Bird UTM Northing	Location of the bird where it was first observed; can be estimated from UTM grid on map
State of Bird When Found	Alive or Dead
Bird Oiling Level	Trace: (<5%) small spots, bird apparently unaffected
	Light: (6-20%) oiling around top of legs, small spots or fine streaks on breast, head, or side; bird still capable of sustained flight
	Moderate: (21-40%) including the belly, and some of the breast or vent; bird exhibits excessive preening, dunking in water, or other unusual behaviour; sustained flight likely compromised
	Heavy: (>40%) including the breast, belly, and maybe the face; the bird is incapable of flight or easily captured
	Complete: completely oiled
End State	Found Dead Recovered, Dead Not Recovered, Euthanized, Alive Lightly Oiled Bird Not Recovered, Alive Moderately/Heavily Oiled Bird Not Recovered
Bird Body Condition	Good, Injured, or Scavenged
Comments	Comments about weather or search conditions, or site characteristics potentially influencing bird mortality and search efficiency

8.0 INCIDENTAL OBSERVATIONS

An oiled, live or dead bird detected outside of a formal bird survey or mortality search procedures is to be recorded using the incidental data form (Table 10). Only those birds that have contacted bitumen associated with process-water are to be recorded in the form. Bird mortalities that are not oiled are to be reported according site procedures and no data or information about these birds are to be entered into any of the data forms in this Protocol.

9.0 QUICK SCAN PROCEDURE

A subset of LIFs excluded from the bird survey and mortality search procedures (either by application of the exclusion criteria or by use of the risk model) are to be surveyed through the monitoring seasons using a quick scan procedure.

By April 16, operators are to identify and provide the names of LIFs to be included in the quick scan procedure. LIFs to be included in the quick scan procedure can be either on or within a short distance from the usual route taken by the bird survey and/or mortality search personnel in the daily course of the monitoring program.

9.1 Quick Scan Schedule

LIFs included in the quick scan procedure are to be searched a minimum of twice per week, from April 16 to October 31, inclusive. Quick scans can be conducted on any day and at any time during daylight hours.

9.2 Quick Scan Data Collection

The entire LIF (open water surface and surrounding habitats within the LIF boundary) is to be scanned. Quick scan data are to be entered into the tablet form (Table 11). There is no minimum time requirement associated with the effort of a quick scan search.

10.0 DATA ANALYSES AND REPORTING

Monitoring personnel are to review the accuracy and completeness of records at the end of each bird survey, habitat assessment, mortality search and quick scan, and correct or complete entries as appropriate prior to submission of the data into the program database. The following are to be confirmed by monitoring crews and site personnel during data review:

- LIF names, station names, and UTM coordinates must be checked to confirm that they apply to the proper survey location;
- survey start and end times are correct and are within the appropriate survey duration;
- comments entered to reflect unique circumstances affecting data interpretation;
- duplicate bird entries are clearly identified by comments; and
- data entries are correct to the best knowledge of the monitoring crews collecting the data.

Table 10: Incidental Data Form

Tablet Field	Description
Submission ID	Field generated automatically when data entered into electronic database on the tablet
Operator	Operator Name
Date	Date of Survey
Monitoring Crew	Bird Survey Crew, Mortality Search Crew, Other
Observer 1	Entered for each observer separately. Observer names are to be provided by the site operator to populate the dropdown menu keyed to the monitoring crew
Observer 2	
Observer 3	
Incidental	Field is automatically generated when the form is opened. All incidental observations are also to be recorded using this form
UTM Easting	Location of observation when oiled bird is first observed. A 6-digit entry is required
UTM Northing	Location of observation when oiled bird is first observed. A 7-digit entry is required
Is the Incidental Associated with a LIF?	Yes or No; If Yes is selected a drop down menu will be populated with the relevant LIF names upon entry of the operator field (do not use codes or abbreviations); a list of LIF names is to be provided by the site operator to populate the drop down menu keyed to the operator name. If No, then the location has to be entered into comments
Location Comments	Comments about the location can be entered here
To Be Completed for all Birds Found Incidentally	
New Migrant, Migrant Seen Previously, or Resident	New Migrant, Migrant Seen Previously, Resident (with chicks or seen often), or Unknown – determined by bird behaviour, date of observations, presence of young birds, and occasionally by species; Residents are best identified from territorial or nesting behaviour and are most likely from mid-May to end-July, but can occur earlier or later depending on species
Species or Group	Species name, or if species unknown then group name (i.e., UNK_GREBE, UNK_DUCK, UNK_DABBLER, etc.); all oiled birds, alive or dead, that are incidentally found are to be recorded regardless of guild. A bird group is defined as a group of birds that all share the same information such same species, substrate where landed, and oiling level. If one or more of these characteristics differ, a new entry must be made for the bird(s)
Guild	Field populated automatically when data entered into Species or Group (i.e., Dabbler, Diver, Wader, Gull, Scavenger, Other (comments required))
Number of Adults and Flight-capable Juveniles	The number of flight-capable landed birds of each species or species group
Number of Chicks	This field is only used when young birds that are incapable of flight are present; otherwise this field will remain blank
Time Bird(s) was Found	Time an oiled bird was first found; includes alive or dead birds, does not include birds with no bitumen contact
Substrate Where Bird was Found	Open Water, Flat/Bank Vegetated, Emergent Vegetation, Island Vegetated, Flat/Bank Non-vegetated, Island Non-vegetated, Bitumen Mat, Artificial Structure or Materials, Other (Other should be used if substrate is woody debris or flooded upland, comments are required)

State of Bird When Found	Alive or Dead
Bird Oiling Level	Trace: (<5%) small spots, bird apparently unaffected
	Light: (6-20%) oiling around top of legs, small spots or fine streaks on breast, head, or side; bird still capable of sustained flight
	Moderate: (21-40%) including the belly, and some of the breast or vent; bird exhibits excessive preening, dunking in water, or other unusual behaviour; sustained flight likely compromised
	Heavy: (>40%) including the breast, belly, and maybe the face; the bird is incapable of flight or easily captured
	Complete: completely oiled
End State	Found Dead Recovered, Dead Not Recovered, Euthanized, Alive Lightly Oiled Bird Not Recovered, Alive Moderately/Heavily Oiled Bird Not Recovered
Bird Body Condition	Good, Injured, or Scavenged; to be used to determine if other evidence of injury or scavenging has occurred
Add Another Species or Species Group	Yes or No
Comments	Comments at discretion of monitoring crew

Table 11: Quick Scan Data Form

Tablet Field	Description
Submission ID	Field generated automatically when data entered into electronic database on the tablet
Operator	Operator Name
Date	Date of Survey
Observer 1	Entered for each observer separately
Observer 2	
Observer 3	
LIF Name	A drop down menu will be populated with the relevant LIF names upon entry of the operator field
Start Time	Enter times in hh:mm:ss format
End Time	
Birds Observed	Yes or No; allows tracking of survey effort when no birds are observed
New Migrant, Migrant Seen Previously, or Resident	New Migrant, Migrant Seen Previously, Resident (with chicks or seen often), or Unknown – determined by bird behaviour, date of observations, presence of young birds, and occasionally by species; Residents are best identified from territorial or nesting behaviour and are most likely from mid-May to end-July, but can occur earlier or later depending on species
Species or Group	Species name, or group name if species unknown (i.e. UNK_GREBE, UNK_DUCK, UNK_DABBLER, etc.); all birds that land are to be recorded regardless of guild. A bird group is defined as a group of birds that all share the same information such as migrant or resident, same species, landed at start, substrate where landed, and oiling level. If one or more of these characteristics differ, a new entry must be made for the bird(s)
Guild	Field populated automatically when data entered into Species or Group (i.e. Dabbler, Diver, Wader, Gull, Scavenger, Other)
Substrate Where Bird Landed	Open Water, Flat/Bank Vegetated, Emergent Vegetation, Island Vegetated, Flat/Bank Non-vegetated, Island Non-vegetated, Bitumen Mat, Artificial Structure or Materials, Other (Other should be used if substrate is woody debris or flooded upland, comments are required)
Number of Adults and Flight-capable Juveniles	The number of flight-capable landed birds of each species or species group
Number of Chicks	This field is only used when young birds that are incapable of flight are present; otherwise this field will remain blank
Number of Oiled Birds	The number of oiled birds including adults and young birds of each species or group
State of Oiled Birds When Found	Alive or Dead
Bird Oiling Level	Trace: (<5%) small spots, bird apparently unaffected
	Light: (6-20%) oiling around top of legs, small spots or fine streaks on breast, head, or side; bird still capable of sustained flight
	Moderate: (21-40%) including the belly, and some of the breast or vent; bird exhibits excessive preening, dunking in water, or other unusual behaviour; sustained flight likely compromised
	Heavy: (>40%) including the breast, belly, and maybe the face; the bird is incapable of flight or easily captured
	Complete: completely oiled
End State	Found Dead Recovered, Dead Not Recovered, Euthanized, Alive Lightly Oiled Bird Not Recovered, Alive Moderately/Heavily Oiled Bird Not Recovered
Bird Body Condition	Good, Injured, or Scavenged

Surface Bitumen Present	None, Floating, Waterline, Ground, or Objects; floating bitumen may be observed on open water and away from shore, bitumen can also be found along the edge of the water or Waterline, on the Ground away from the water, and/or on Objects (e.g., boom, container, woody debris)
Surface Bitumen Amount (% of Survey Area)	None: 0%
	Very Low: 1 to 10%
	Low: 11 to 25%
	Moderate: 26 to 50%
	High: 51 to 75%
	Very High: 76 to 100%
Comments	Provide any comments if warranted

Estimates of bird contacts (landings) within survey areas and associations between bird observations (number and species) and habitats are useful in support of site management practices.

An estimate of bird landings by habitat type per hectare per day will be determined for each survey area. The area of each survey area will be calculated from a combination of GIS analyses and ground-level habitat characterization. An estimate of bird mortalities per unit area of effort will be determined.

Numerous factors affect the ability to detect oiled, dead birds, including habitat, visible range and bird condition. To the extent possible, the habitat in which the mortality was detected is to be recorded. These data will not be used to derive habitat-specific mortality estimates; rather, it these habitat associations may provide insight into detectability of oiled, dead birds.

The Program Manager will prepare the regional report, and coordinate with operators the preparation of the site-specific documents that will meet the requirements of their individual approvals, authorizations and bird/waterfowl/waterbird protection plans.

11.0 REFERENCES

Owl Moon Environmental Inc. (OMEI) (2015) Oil Sands Bird Contact Monitoring Program, 2015 Protocol. Program Description & Rationale for Changes. Prepared for Canadian Natural Resources Limited, Imperial Oil Canada Limited, Shell Canada Energy, Suncor Energy Inc. and Syncrude Canada Limited. 75 pp.

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St. Clair, C.C., Habib, T., Ball, J. and Loots, S. (2012) Regional Bird Monitoring Plan 2011 Annual Report. Prepared for Alberta Environment and Water and mineable oil sands operators. March 2012, 144 pp. plus appendices.

U.S. Fish & Wildlife Service (2010) Natural Resource Damage Assessment Work plan for Determining Injury to the Piping Plover (*Charadrius melodus*) from the Deepwater Horizon (MC 252) Oil Spill, Bird Study #7. 21 pp.

Appendix A

Species of Conservation Concern

Species Code	Common Name	Scientific Name	COSEWIC Status (2014)	SARA Status (2014)	Alberta General Status (Fish and Wildlife Service, AESRD, 2010)	Alberta Wildlife Act (Alberta's Endangered Species Conservation Committee, AESRD, 2014)
TRUS	Trumpeter Swan	*Cygnus buccinator*			At Risk	Special Concern
NOPI	Northern Pintail	*Anas acuta*			Sensitive	
GWTE	Green-winged Teal	*Anas crecca*			Sensitive	
LESC	Lesser Scaup	*Aythya affinis*			Sensitive	
HADU	Harlequin Duck	*Histrionicus histrionicus*			Sensitive	Special Concern
WWSC	White-winged Scoter	*Melanitta fusca*			Sensitive	Special Concern
GRSG	Greater Sage-grouse	*Centrocercus urophasianus*	Endangered	Endangered	At Risk	Endangered
STGR	Sharp-tailed Grouse	*Tympanuchus phasianellus*			Sensitive	
GRPC	Greater Prairie-Chicken	*Tympanuchus cupido*	Extirpated	Extirpated	Extripated	
PBGR	Pied-billed Grebe	*Podilymbus podiceps*			Sensitive	
HOGR	Horned Grebe	*Podiceps auritus*	Special Concern		Sensitive	
WEGR	Western Grebe	*Aechmophorus occidentalis*	Special Concern		Sensitive	Threatened
CLGR	Clark's Grebe	*Aechmophorus clarkii*			May Be At Risk	
AWPE	American White Pelican	*Pelecanus erythrorhynchos*			Sensitive	
AMBI	American Bittern	*Botaurus lentiginosus*			Sensitive	
GBHE	Great Blue Heron	*Ardea herodias*			Sensitive	
BCNH	Black-crowned Night-heron	*Nycticorax nycticorax*			Sensitive	
WFIB	White-faced Ibis	*Plegadis chihi*			Sensitive	
OSPR	Osprey	*Pandion haliaetus*			Sensitive	
BAEA	Bald Eagle	*Haliaeetus leucocephalus*			Sensitive	
NOHA	Northern Harrier	*Circus cyaneus*			Sensitive	
NOGO	Northern Goshawk	*Accipiter gentilis*			Sensitive	
BWHA	Broad-winged Hawk	*Buteo platypterus*			Sensitive	
SWHA	Swainson's Hawk	*Buteo swainsoni*			Sensitive	

Species Code	Common Name	Scientific Name	COSEWIC Status (2014)	SARA Status (2014)	Alberta General Status (Fish and Wildlife Service, AESRD, 2010)	Alberta Wildlife Act (Alberta's Endangered Species Conservation Committee, AESRD, 2014)
FEHA	Ferruginous Hawk	*Buteo regalis*	Threatened	Threatened	At Risk	Endangered
GOEA	Golden Eagle	*Aquila chrysaetos*			Sensitive	
YERA	Yellow Rail	*Coturnicops noveboracensis*	Special Concern	Special Concern	Undetermined	
SORA	Sora	*Porzana carolina*			Sensitive	
SACR	Sandhill Crane	*Grus canadensis*			Sensitive	
WHCR	Whooping Crane	*Grus americana*	Endangered	Endangered	At Risk	Endangered
PIPL	Piping Plover	*Charadrius melodus*	Endangered	Endangered	At Risk	Endangered
MOPL	Mountain Plover	*Charadrius montanus*	Endangered	Endangered	At Risk	Endangered
BNST	Black-necked Stilt	*Himantopus mexicanus*			Sensitive	
UPSA	Upland Sandpiper	*Bartramia longicauda*			Sensitive	
ESCU	Eskimo Curlew	*Numenius borealis*	Endangered	Endangered	Extinct	
LBCU	Long-billed Curlew	*Numenius americanus*	Special Concern	Special Concern	Sensitive	Special Concern
REKN	Red Knot	*Calidris canutus*	Endangered	Endangered	May Be At Risk	
BBSA	Buff-breasted Sandpiper	*Tryngites subruficollis*	Special Concern		Secure	
CATE	Caspian Tern	*Hydroprogne caspia*			Sensitive	
BLTE	Black Tern	*Chlidonias niger*			Sensitive	
FOTE	Forster's Tern	*Sterna forsteri*			Sensitive	
PAPI	Passenger Pigeon	*Ectopistes migratorius*			Extinct	
NOPO	Northern Pygmy-owl	*Glaucidium gnoma*			Sensitive	
BUOW	Burrowing Owl	*Athene cunicularia*	Endangered	Endangered	At Risk	Endangered
BADO	Barred Owl	*Strix varia*			Sensitive	Special Concern
GGOW	Great Gray Owl	*Strix nebulosa*			Sensitive	
SEOW	Short-eared Owl	*Asio flammeus*	Special Concern	Special Concern	May Be At Risk	
CONI	Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Sensitive	
LEWO	Lewis's Woodpecker	*Melanerpes lewis*			Sensitive	
BBWO	Black-backed Woodpecker	*Picoides arcticus*			Sensitive	
PIWO	Pileated Woodpecker	*Dryocopus pileatus*			Sensitive	

Species Code	Common Name	Scientific Name	COSEWIC Status (2014)	SARA Status (2014)	Alberta General Status (Fish and Wildlife Service, AESRD, 2010)	Alberta Wildlife Act (Alberta's Endangered Species Conservation Committee, AESRD, 2014)
AMKE	American Kestrel	*Falco sparverius*			Sensitive	
PEFA	Peregrine Falcon	*Falco peregrinus*	Special Concern	Special Concern	At Risk	Threatened
PRFA	Prairie Falcon	*Falco mexicanus*			Sensitive	Special Concern
OSFL	Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	May Be At Risk	
WEWP	Western Wood-pewee	*Contopus sordidulus*			Sensitive	
LEFL	Least Flycatcher	*Empidonax minimus*			Sensitive	
EAPH	Eastern Phoebe	*Sayornis phoebe*			Sensitive	
GCFL	Great Crested Flycatcher	*Myiarchus crinitus*			Sensitive	
LOSH	Loggerhead Shrike	*Lanius ludovicianus*	Threatened	Threatened	Sensitive	Special Concern
CLNU	Clark's Nutcracker	*Nucifraga columbiana*			Sensitive	
PUMA	Purple Martin	*Progne subis*			Sensitive	
BANS	Bank Swallow	*Riparia riparia*	Threatened		Secure	
BARS	Barn Swallow	*Hirundo rustica*	Threatened		Sensitive	
BRCR	Brown Creeper	*Certhia americana*			Sensitive	
SEWR	Sedge Wren	*Cistothorus platensis*			Sensitive	
SATH	Sage Thrasher	*Oreoscoptes montanus*	Endangered	Endangered	Undetermined	
SPPI	Sprague's Pipit	*Anthus spragueii*	Threatened	Threatened	Sensitive	Special Concern
CCLO	Chestnut-collared Longspur	*Calcarius ornatus*	Threatened	Threatened	Sensitive	
MCLO	McCown's Longspur	*Calcarius mccownii*	Special Concern	Special Concern	Secure	
COYE	Common Yellowthroat	*Geothlypis trichas*			Sensitive	
CMWA	Cape May Warbler	*Dendroica tigrina*			Sensitive	Recommended: Special Concern
BBWA	Bay-breasted Warbler	*Dendroica castanea*			Sensitive	Recommended: Special Concern
BLBW	Blackburnian Warbler	*Dendroica fusca*			Sensitive	
BTBW	Black-throated Blue Warbler	*Dendroica caerulescens*			Accidental	Special Concern
BTNW	Black-throated Green Warbler	*Dendroica virens*			Sensitive	

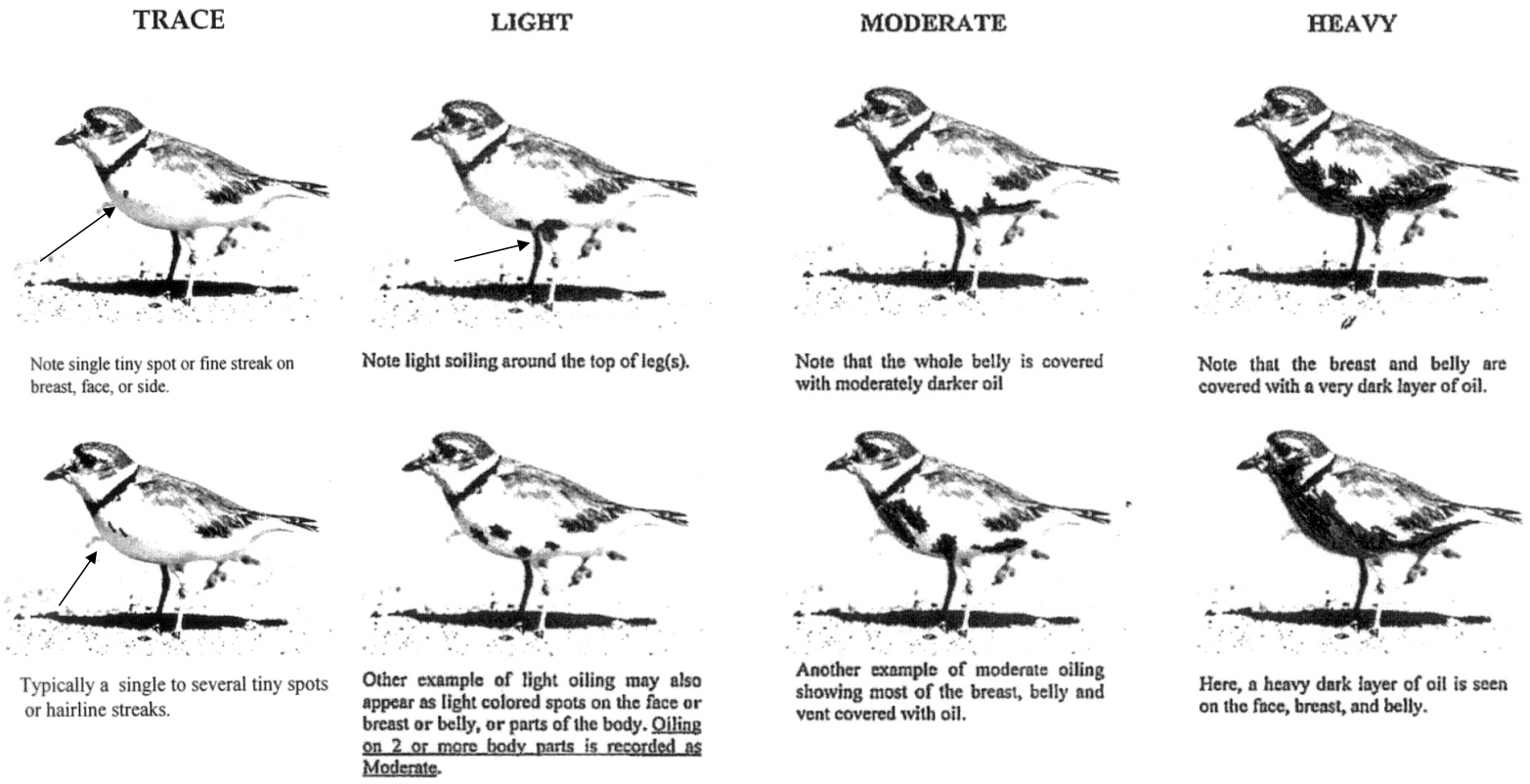
Species Code	Common Name	Scientific Name	COSEWIC Status (2014)	SARA Status (2014)	Alberta General Status (Fish and Wildlife Service, AESRD, 2010)	Alberta Wildlife Act (Alberta's Endangered Species Conservation Committee, AESRD, 2014)
CAWA	Canada Warbler	*Wilsonia canadensis*	Threatened	Threatened	Sensitive	
BRSP	Brewer's Sparrow	*Spizella breweri*			Sensitive	
GRSP	Grasshopper Sparrow	*Ammodramus savannarum*			Sensitive	
BAIS	Baird's Sparrow	*Ammodramus bairdii*	Special Concern		Sensitive	
WETA	Western Tanager	*Piranga ludoviciana*			Sensitive	
BOBO	Bobolink	*Dolichonyx oryzivorus*	Threatened		Sensitive	
RUBL	Rusty Blackbird	*Euphagus carolinus*	Special Concern	Special Concern	Sensitive	
BAOR	Baltimore Oriole	*Icterus galbula*			Sensitive	

Appendix B

U.S. Fish & Wildlife Service (2010)

Characterization of Bird Oiling Levels

NRDA Bird Oiling Levels



Bird Oiling Levels using Piping Plover as an example (extracted from U.S. Fish & Wildlife Service 2010)