Adaptive Approach to Ice Management in Areas Occupied by Pacific Walruses

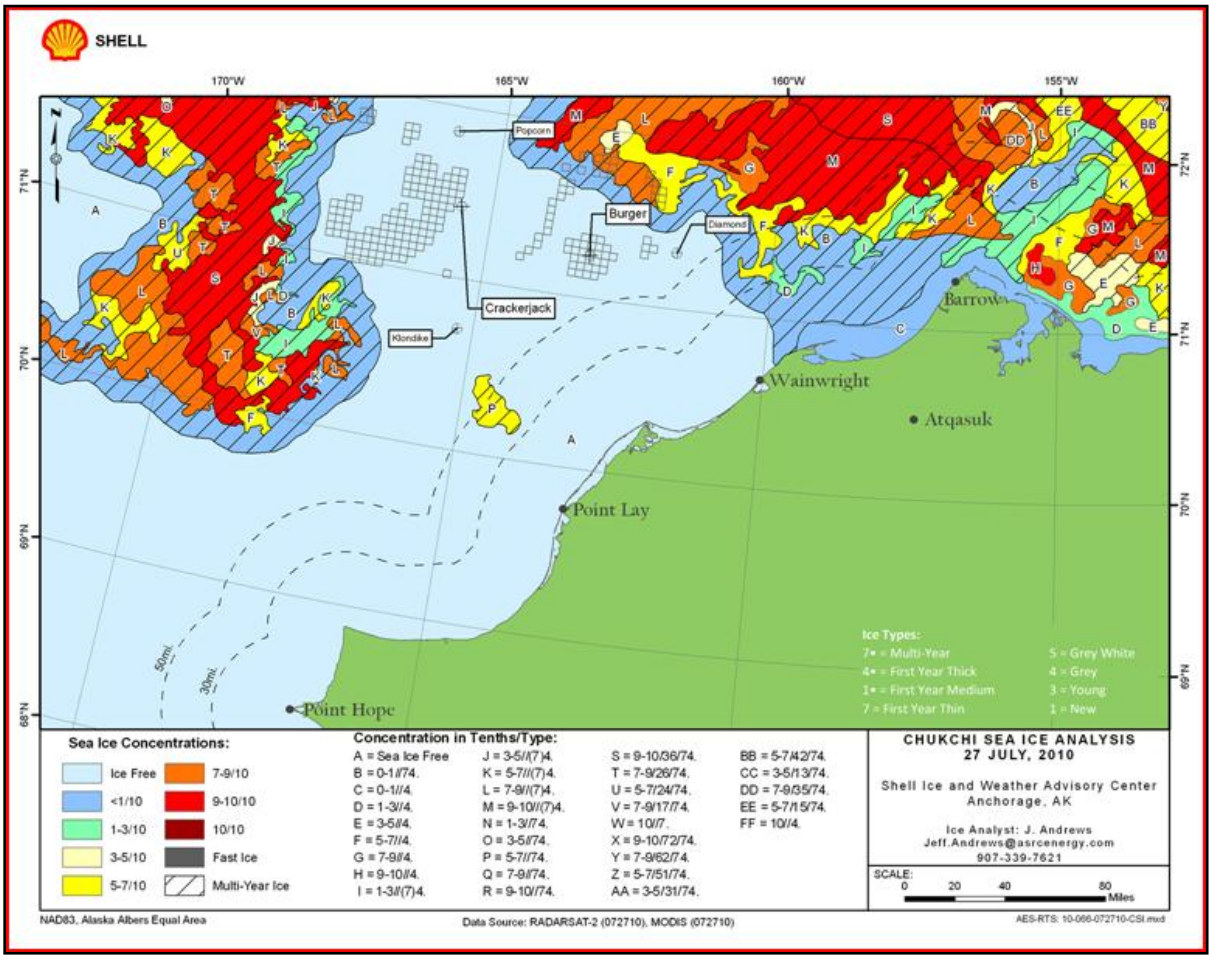

Figure 1: High resolution ice map from the SIWAC program depicting ice distribution and characteristics

The corner post of the adaptive management approach to managing ice in areas occupied by Pacific walruses will be monitoring of both ice and marine mammals, including walruses, such that sufficient lead time is provided for consultation and planning. During the period of operations Shell will conduct a robust program of ice and weather monitoring and forecasting. A team of ice specialists will work daily with synthetic aperture radar images purchased for the purpose of producing high resolution maps of ice floes within the project area (Chukchi Sea (Figure 1). The results of these analyses and forecasts are posted daily to the Shell Ice and Weather Advisory Center (SIWAC). The SIWAC information is available by permission at www.siwac.com.

Weather forecasts are supported by a network of industry funded and deployed met-ocean buoys, coastal weather reporting installations, and regular observations following standardized protocols from all Shell vessels operating in the theater. Professional meteorologists analyze these data and update NOAA weather models to provide real time support of operations and localized weather forecasts.

Satellite imagery of ice conditions is also supplemented by observations from vessels. When conditions indicate the need, the primary ice management vessel will scout ice in the vicinity of drilling operations. Professional ice advisors will assess ice conditions and provide detailed descriptions and real time

consultation to the ice team. Through ice tracking and weather forecasting, the likelihood that Shell would be surprised by changing ice conditions and forced to take action without appropriate consultation and planning is low.

Walrus distribution data will be derived from three different sources. Protected species observers (PSOs) will be aboard vessels engaged in the Shell drilling program and will provide daily reports of walrus and other marine mammal observations. These observations will be reported to U.S. Fish & Wildlife Service (FWS) on a daily basis. Due to the critical activities of the primary ice management vessels, five PSOs will be aboard these vessels and will provide coverage 24 hours per day with two people on duty. Since these vessels are most likely to be operating in close proximity to the ice, the PSOs and vessel operators will have additional training in walrus avoidance and mitigation requirements. Observations will also be aided by the installation of Big-Eye binoculars. The data from these vessels will be reported at least daily. In addition to the observations of vessel based PSOs, Shell will operate aerial overflights in both the nearshore (within 25 miles of shore), alongshore, and offshore (Figures 2 and 3). The overflights will be conducted utilizing a fixed winged aircraft flying at 1,000 feet elevation during surveys. High resolution still frame cameras will capture overlapping images during surveys. This sensor package is being evaluated for applicability in unmanned aerial system (UAS), which is the preferred platform for aerial monitoring in the future. The imagery from these offshore overflights will be processed as soon as possible.

When the offshore drilling area cannot be accessed, the nearshore/alongshore (N/A) flights will be conducted, weather permitting (Figure 3). There is also the possibility that the N/A flights would be shifted to higher priority, if observations of possible haulouts were deemed of greater value. Priority for operation of offshore v. n/a flights will be established through consultation with trust agencies, including FWS, and stakeholders.

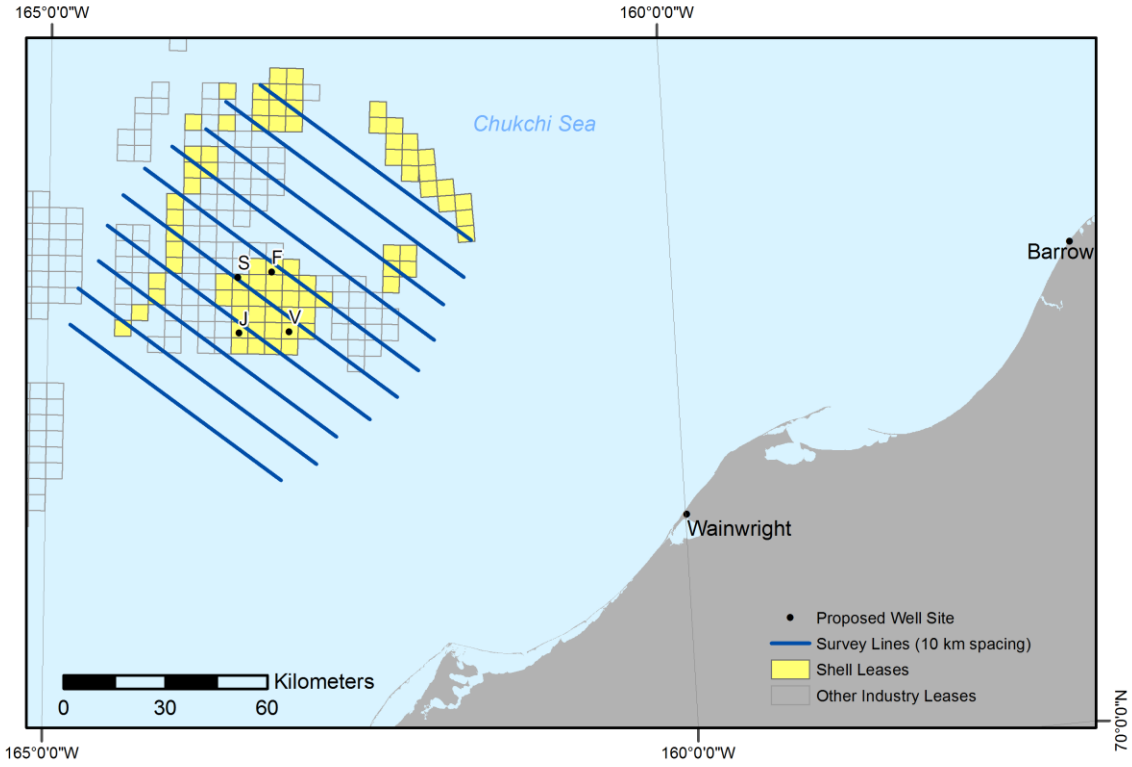

Figure 2: Proposed survey grid for offshore aerial overflights.

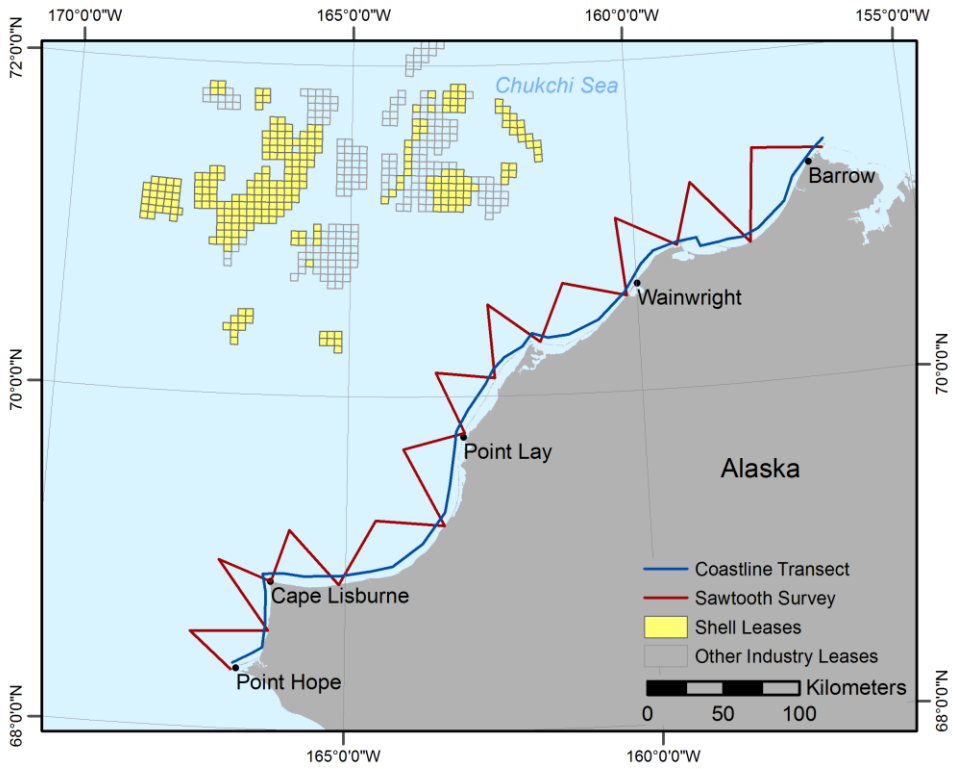

Figure 3: Proposed survey grid for nearshore/alongshore aerial surveys.

Additional sources of information that will be utilized to forecast the potential for presence of walruses in the project area will be the data from NMFS aerial survey flights (ASSAM) and USGS tagged animals. At a minimum, Shell will utilize data posted to the USGS walrus tracking and NMFS aerial survey websites. Shell will also endeavor to work closely with agencies, such that Shell will have access to data prior to its being posted on the website.

Utilizing these three data sources that provide indications of walrus distribution in combination with ice maps and forecasts, Shell will be able to generate daily assessments of the potential need to manage ice and the potential for such activities to interact with walruses.

On the basis of these daily assessments, risk can be assessed as:

- **1** (no immediate need to manage ice and/or no walrus are present in the project area),
- **2** (possibility exists for ice management and walrus may be present), and
- **3** (active ice management will be required, walruses are present and potential exists for impacts to walruses).

Risk level will be developed by Shell through consultation between ice & weather monitoring and marine mammal monitoring, both of which report to the Science Lead, and with the wells group. The daily risk level will be communicated to USFWS by email as a part of the daily report. The flow chart in Figure 4 presents the process that will be used to rank risks and initiate consultation both within Shell and between Shell and USFWS. The Adaptive Approach functions as outlined in Table 1.

At present the nominal plan is for both Shell and USFWS to maintain a 24 hour duty phone for the purpose of consultation.

Table 1: Risk Levels for Interactions with Walrus

Step 1: Ice and weather forecasting will evaluate the potential risk to vessels and the drilling process on the basis of proximity of ice to the drilling operation and factors influencing ice movement. **Step 2**: The risk level will be communicated to USFWS on a daily basis.	
	If the area of operation is ice free or there is a low probability that ice could impact vessels and drilling operations the risk level is **1:** • monitoring continues, and • USFWS notified by email.
	If ice is in close proximity, or otherwise potentially threatening vessels and drilling operations, walrus distribution information will be considered. Walrus distribution information will be treated conservatively. There may be times during the season (e.g. late October) when the potential for walruses within the project area is extremely low and risk level could be assessed as **1**. Otherwise, the difficulty of knowing where all concentrations are, given incomplete monitoring capabilities, leads to the assumption that they may be present. In such cases, the risk level would be elevated to **2**. • The USFWS would be notified by email, and • Updates will be provided by telephone, or in person, during regular business hours. When at a risk level of **2**, ice management vessels will provide scouting reports that evaluate ice conditions and the presence and distribution of walruses. PSOs on board these vessels will provide around the clock monitoring and will endeavor to assess the potential to disturb walruses through ice management activities. If ice management is needed and IF the entire ice floe and surrounding areas can be visualized and no walruses are hauled out on the ice, ice management may proceed with care.
	If walruses are present and hauled out on ice which poses an imminent threat to vessels and/or drilling operations and ice management is needed, the risk level will be elevated to **3**: • The on duty compliance representative for Shell will notify a designated USFWS representative by calling a duty phone to engage in real-time consultation. • The Shell drilling supervisor will be engaged to evaluate the status of drilling operations and the potential for implementation of ice avoidance measures that may include cessation of drilling activities and moving off hole in extreme cases. If such alternatives are available and can be implemented, these procedures will be implemented. • Real-time communications will be established with the lead PSO on the ice management vessel(s) to assess the proximity and status of walruses hauled out on ice floes that need to be managed. Descriptions of the situation will be shared with the consultation team. • If the team agrees that ice management can go forward, the vessel will approach the ice floe slowly in an effort to avoid causing a stampede. Video cameras and still cameras will be used to document procedures and results to enhance the understanding of the risks posed by ice management activities. • Real time consultation will continue as long as ice management is required, or until the consultation team agrees that procedures are going forward successfully. • A post action report will be filed with USFWS within 24 hours. To the extent that communications will allow the transfer of still frame and video, photographic documentation will be included. • If real-time consultation cannot be established, and, if ice management cannot be avoided to protect vessels and critical drilling operations, Shell will proceed as per the flow chart below exercising all due care to avoid impacts to walruses.

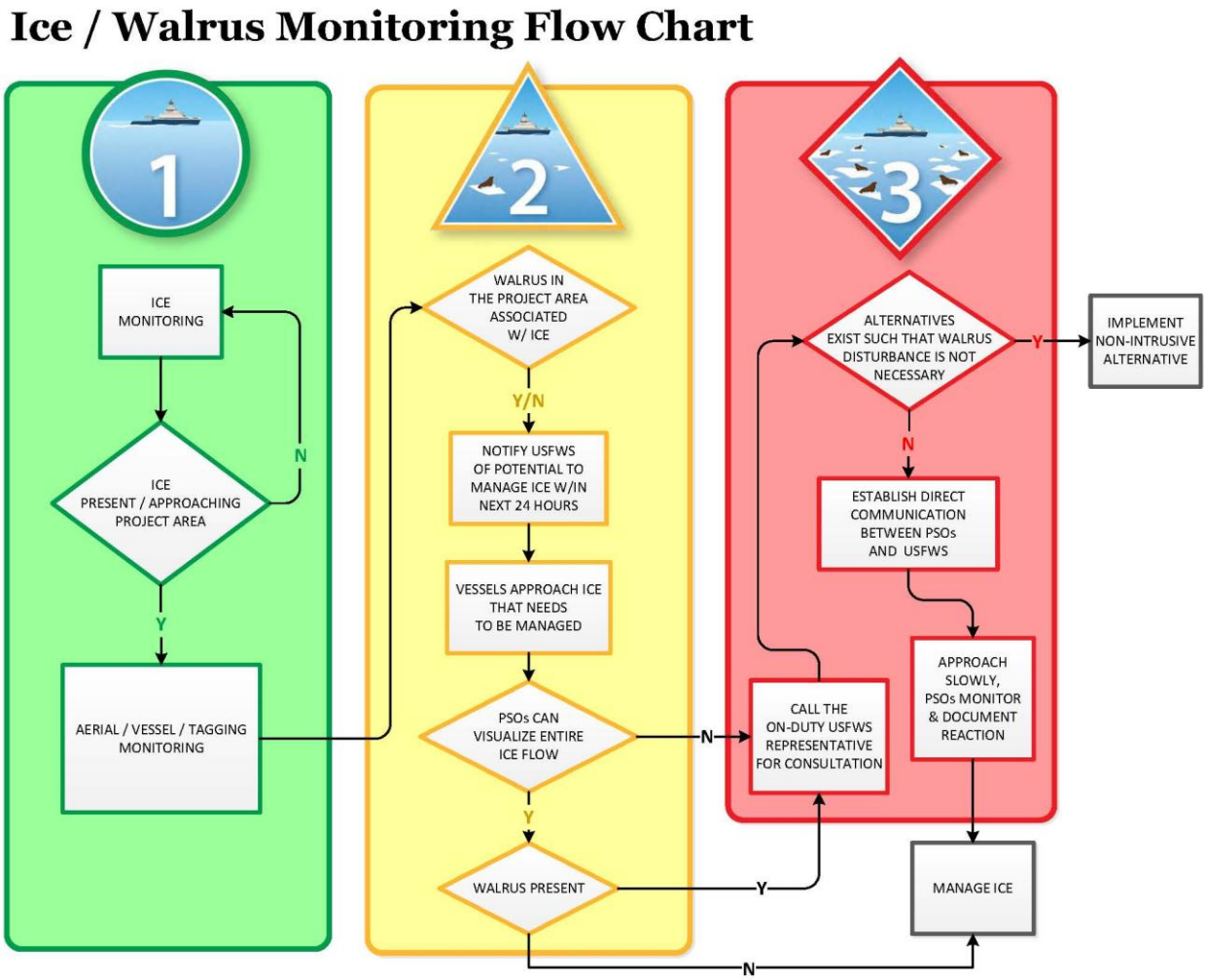

Figure 4: Flow chart of risk levels based upon ice, weather, and walrus monitoring.