S.L. Ross Oil Deposition Modeling

Buccaneer is providing the following discussion regarding the use of a blowout model at the request of ADEC per 18 AAC 75.425(e)(1)(F) and (I) for approximating how crude oil might be deposited from an aerial plume caused by an exploration well blowout at the Cosmopolitan site. 18 AAC 75.425(e)(1)(I) states that "a plan holder may use for development of a response scenario the July 1997 S.L. Ross oil deposition model for surface well blowouts, or another oil deposition model approved by the department for surface oil well blowouts." Since the Cosmopolitan site is located offshore, the useful application of the S.L. Ross model for predicting oil deposition in Cook Inlet is impracticable. We have included the following discussion to demonstrate how the S.L. Ross model is not appropriate for use in this case. Other models are discussed where it has been determined that the Cook Inlet Oil Spill Model (CIOSM) as provided by the Cook Inlet Regional Citizen's Advisory Council (CIRCAC) is the best available model for Cook Inlet for estimating how oil might be deposited and for the pre-planning of the protection of resources, such as the environmentally sensitive areas identified by the Geographic Response Strategy (GRS) locations.

The oil deposition model for an aerial plume is based on the S.L. Ross oil deposition model.[1] This ADEC-approved model is helpful for calculating the trajectory, and subsequent fallout distribution from an aerial plume with respect to distance and width. According to the S.L. Ross model, an unobstructed *surface* well blowout could send a plume of oil into the atmosphere, and the subsequent distribution of oil falling from the aerial plume depends on how high the oil is propelled, wind speed, and the size of the oil droplets. The model takes no account of tides, currents or the subsurface discharge of oil.

Main Factors Controlling Aerial Plume

The main factors controlling plume height (and subsequent fallout distribution) are: oil flow rate; gas flow rate; pipe diameter; predominant wind direction and speed. The model must also assume that the oil is ejected from the rig floor and that there is then no movement of the surface on which it is deposited, which is not the case in Cook Inlet.

Oil Flow Rate

Per 18 AAC 75.434(f), AOGCC has issued a letter dated 10/10/12 that allows for the use of 800 bopd as the RPS for the ODPCP for a surface well blowout

Gas Flow Rate

The gas flow rate used in the model is a function of daily gas-to-oil ratio (GOR) as quantified by standard cubic feet per barrel of oil (scf/bbl). To develop the GOR, Buccaneer picked the highest GOR from previous testing and drilling at this site, as it would provide the most conservative standard for use in modeling.

Plume Calculation

Based on Figure 1 below (from the SL Ross Model), applying a flow rate of 800 bopd and a GOR of 300 scf/bbl will result in an extrapolated gas flow rate of 0.24 million standard cubic feet (mmscfd) from a surface well blowout (indicated by the red dot). As noted below, the shaded area is out of the range of the model assumptions. This effectively means that a plume cannot be modeled, as a plume does not exist in this case.

[1] *Oil Deposition Modeling for Surface Oil Well Blowouts (prepared by S. L. Ross Environmental Research Ltd. for Alaska Clean Seas, July 1997)*

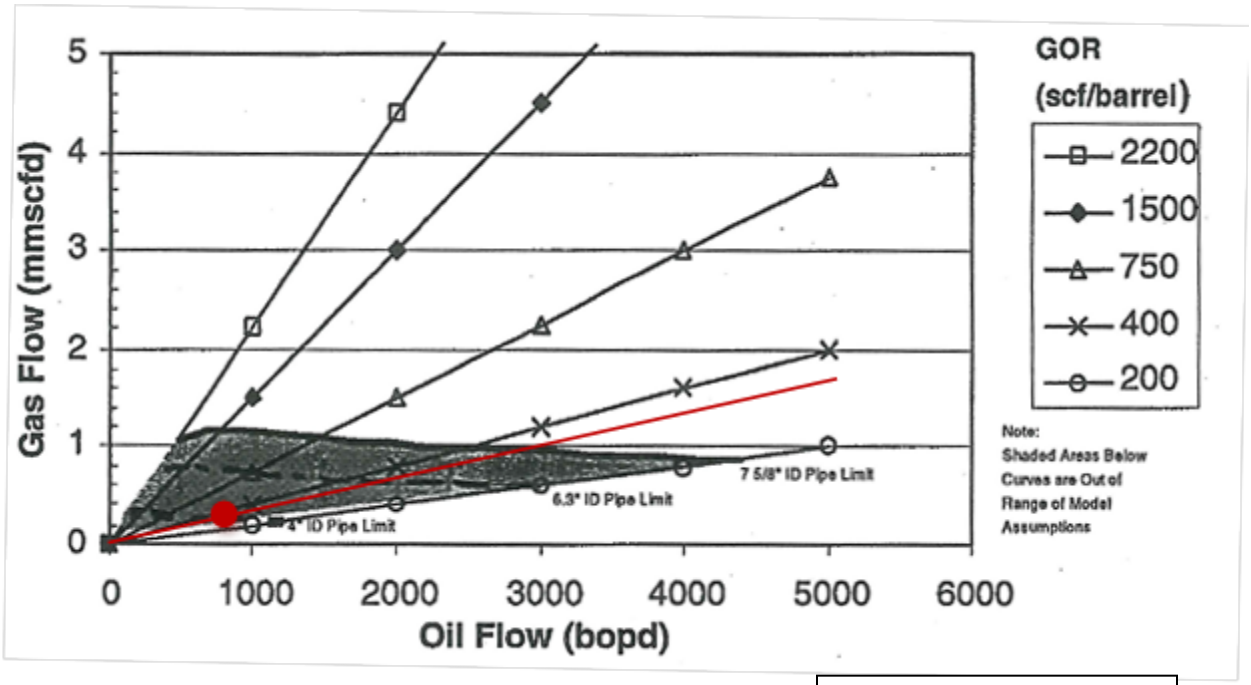

Figure 1 – S.L. Ross Plume Modeling

Red dot marks Cosmo well (800 bopd, 0.24 mmscfd, 300 GOR).

Other Models

The General NOAA Operational Modeling Environment (GNOME) developed by the National Oceanic and Atmospheric Administration (NOAA) is an oil spill trajectory model that is used nationally to model spill scenarios. This model was not used in this mapping effort because there were no location files or associated resources available for the Cook Inlet Region. Previous Discussions with GNOME administrators revealed an update to the GNOME resources to include Cook Inlet was expected by November 2011, however, as of November 2012, this has not occurred and the model remains unusable for Cook Inlet.

The Cook Inlet Oil Spill Model (CIOSM) version 2.01vb6 developed by Cook Inlet Regional Citizen's Advisory Council (CIRCAC) was used to estimate the trajectory of a plume of oil over eight days. The CIOSM model limitations can provide trajectory estimation for a maximum of eight days. The COISM is an experimental model that does not take into account 3D hydrography, dispersion, evaporation, spill response efforts, or variable winds. In spite of these limitations, CIOSM was considered the best available technology to estimate possible impacts to GRS locations for Cook Inlet since no other model like this currently exists for Cook Inlet. The model and user's manual were downloaded from the CIRCAC public website.

The Automated Data Inquiry for Oil Spills (ADIOS2) developed by the National Oceanic and Atmospheric Administration (NOAA) was also used to estimate the trajectory of an oil spill in Cook Inlet. The ADIOS2 program allowed the user to input a reduced spill quantity to account for response and clean up efforts. Locations cannot be programmed like in the CIOSM model, instead providing a "mass balance" calculation based on various hydrologic factors and oil characteristics. The model is most useful for determining emulsion and evaporation rates and factors, but its use in Cook Inlet is limited due to the hydrophilic sediment load that is outside of the model parameters.

Protection of Geographic Response Strategy (GRS) Locations

The CIOSM model was run to determine any potentially impacted GRS locations using average winter winds (speed and direction) assuming no response actions are taken as a "worst case" scenario to allow for sufficient time to plan for the deployment of appropriate oil spill response equipment to prevent any discharged oil from impacting a GRS location and on a schedule that protects those areas before the oil reaches them according to the predicted oil trajectories (18 AAC 75.445(d)(4). Since the S.L. Ross model does not predict which areas might be impacted by an oil discharge and the CIOSM does, the CIOSM was used to meet this requirement. See Figure 1.6-3 in the Winter Response Scenario and Figure E-5 in the site-specific appendix.

Conclusion: The S.L. Ross model is not applicable in the case of oil discharges to the waters of Cook Inlet. CIOSM is a more appropriate model for predicting oil spill trajectories. The S.L. Ross model is useful for establishing a safety zone for response vessels to work around the blowout, assuming the blowout is at the surface (rig floor), and not subsurface.