APPENDIX J

DATA FORM AND INSTRUCTIONS FOR ITS COMPLETION
(revised March 2023)

The following members of the **Pacific Seabird Group's Marbled Murrelet Technical Committee, Inland Survey Protocol Team** contributed to reviewing and updating this appendix.

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Survey Cover Page Instructions

Item #

1 Page Number of the total number of pages of data for the survey. This includes Cover Page, Survey Activity Table page(s), and Map page(s).

2 Total Detections: Total number of murrelet detections recorded during a survey visit. All detections should be assigned a detection number (Detect. #), including un-mappable detections. No other species observations should be included in this count.

3 Other Species of Concern: Circle **Y** (Yes) or **N** (No) to indicate if species of concern other than Marbled Murrelet were observed; refer to your state or provincial Fish and Wildlife agency Species of Concern list. Record details of observation(s) ***in the notes section at the end of the last page of the Survey Activity Page***. Do not assign a detection number to non-murrelet observations

4 Month, Day, Year: Date of survey visit. Use 2 digits for Month and Day, and four digits for Year (e.g., May 10, 2000 = 05/ 10/ 2000).

5 Area Name: Name of survey area being surveyed.

6 Stratum Name / Number: Stratum name and number from which survey visit is conducted. Each survey stratum should have a ***unique*** number or alphanumeric identifier.

7 Station ID: Station ID (number, letter, etc.) from which survey visit is conducted. Each survey station should have a ***unique*** alphanumeric identifier relative to a survey stratum.

8 Station Location: Location of station where survey visit was conducted.

UTM - Enter the UTM zone, coordinates and map datum (e.g., NAD83) from the Station Information Form, unless the survey was conducted from a different location due to noise or other disturbances (explain in notes).

9 Observer Name(s): First name, middle initial, and last name of the observer(s).

10 Initials: Legible initials of observer's full name.

11 Affiliation: Agency, tribe, or company name.

12 Phone: Agency, tribe, or company telephone number including area code. This should be a contact that can be reached during and after the survey season in the event that questions arise regarding the survey data.

13 Sunrise Time: Official sunrise time derived from tables based on the date of the survey visit and the geographic area; See Table references below; do not use newspaper or tide table sources. ***Add 1 hour for daylight-saving time!*** Use 4-digit "24 Hour Time"(e.g., 5:18 A.M. = 0518, or 6:30 P.M. = 1830).

14 Source: Indicate the Sunrise/Sunset table used to determine the survey times. Sunrise tables are obtained from the U.S. Naval Observatory at web stratum: https://www.esrl.noaa.gov/gmd/grad/solcalc/

15 Begin Survey Time: Actual time survey visit is started using "24 Hour Time" described above. A morning visit should begin ***at least*** **45** minutes before official sunrise. If a survey visit actually begins later, also note the number of minutes late (e.g., "5 min. late").

16 End Visit Time: Actual time survey visit is completed using "24 Hour Time" described above. A morning visit typically ends **75** minutes ***after*** official sunrise; more time is added when murrelet detections occur within the last 15 minutes of a visit.

ENVIRONMENTAL CONDITIONS: Record conditions as observed at the survey station at the beginning and end of the survey visit; also note any significant changes in conditions that affect murrelet detectability as they occur throughout the survey visit. Enter duration of such conditions in the notes column:

- Record any conditions that affect vertical visibility to 1 canopy height, horizontal visibility to 100 m (328 feet), and audibility to 200 m (656 feet). If these conditions exist for a cumulative total of greater than ***12 minutes*** during the survey visit, the visit should be rescheduled, unless occupied behavior is observed.

17 Time: Record times in 4-digit "24 Hour Time". Enter the time when the survey visit began and ended and indicate "Begin Survey " and "End Survey " in the Notes column. Also enter the time when significant weather or environmental conditions occur that affect murrelet detectability from the station.

18 Vertical Viewing:

Visibility is best assessed when the sky lightens. Enter '**U'** for Unknown at the beginning of the survey if darkness prevents an accurate assessment, but remember to update as soon as possible and whenever significant changes occur.

- Ceiling: This is the height of the ***primary*** cloud/fog ceiling layer relative to the canopy of the survey stratum as viewed from the station. Record the appropriate code: **UL** Unlimited (clear); **HI** > 2.0 canopy height; **MID** ≥ 1.5 to ≤ 2.0 canopy height; **LO** >1.0 to <1.5 canopy height; **SUB** ≤ 1.0 canopy height; **U** = Unknown; cannot see adequately to describe due to lack of light.
    - There may be several layers of clouds visible simultaneously during a survey visit. For this protocol, the ceiling is the continuous primary cloud layer most closely associated, and in proximity to the forest canopy. Patchy ground fog may develop as the air temperature warms above water bodies or forests and can affect vertical viewing as well as horizontal. These types of conditions should be reported as fog in the Precipitation column of the survey form.

- Cloud Cover: Select the class code that best describes the amount of overhead cloud cover visible from the station.
- Codes: **0** = 0% (clear sky; no cloud cover); **1** = about 33% of sky covered; **2** = about 66% of sky covered; **3** = 100% of sky covered; **U** = Unknown; cannot see adequately to describe conditions due to lack of light.

- Visibility to 1x Canopy: From the survey station, note whether vertical visibility is unimpeded to 1x canopy height. Codes: **Y** = Yes; **N** = No; **U** = Unknown; cannot see adequately to describe conditions due to lack of light.

19 Horizontal Visibility to 100 m: From the survey station, note whether horizontal visibility is unimpeded within 100 m (328 feet). Codes: **Y** =Yes; **N** = No; **U** = Unknown; cannot see adequately to describe conditions due to station placement.

20 Audibility to 200 m –Y/N: From the survey station, note whether audibility is unimpeded within a 200 m (656 feet) radius. Codes: **Y** = Yes; **N** = No

21 Noise: Record the appropriate code(s) to indicate noise conditions that ***affect ability to hear murrelet calls*** within a 200 m (656 feet) radius: **N** = None; **A** = Aircraft; **B** = Bird song/calls; **C** = Creek or other water drainage; **M** = Machinery (logging, mining, road construction, etc.); **P** = Precipitation: rain/hail; **T** = Tree drip; **V** = Vehicle (trucks, cars, etc.);
W = Wind; **O** = Other (***explain in Notes column***). List more than one if applicable. Note the time and duration of any noise that impedes murrelet detectability

22 Precipitation: Select the appropriate codes to indicate precipitation intensity at the survey stratum as observed from the station. List only one code per column. Use the following codes in each of the type columns

Rain: **N** = None; **L** = Light (mist, drizzle, soft rain)); **M** = Moderate (obscuring rain); **H** = Heavy (intense rain).

Fog: **N** = None; **L** = Light (translucent haze, thin fog)); **M** = Moderate (obscuring fog); **H** = Heavy (dense fog)

Other: For other precipitation conditions use the following type and intensity codes: **N** = None; **HL** = Light hail; **HM** = Obscuring hail; **HH** = Intense hail; **SL** = Snow flurry; **SM** = Obscuring snows; **SH** = Intense snow storms, Blizzard

23 Wind: Record the wind speed based on the Beaufort Wind Scale. Observe the effects of wind conditions on trees and vegetation visible ***at ground level at the station*** and record the appropriate code (0= <1 mph, calm; 1= 1-3 mph, leaves barely move; 2= 4-7 mph, leaves rustle and small twigs move; 3= 8-12 mph, leaves and small twigs in constant motion; 4= 13-18 mph, small branches move; 5= 19-24 mph, large branches and small trees start to sway; 6= 25-31 mph, large branches in constant motion; 7= 32-38 mph, whole trees move; 8= 39-46 mph, twigs and small branches break).

- Moderate to high winds of Beaufort 4 (13-18 mph) and above generally affect audibility. A handheld wind meter can be helpful if one is available.
- If wind noise impedes audible detections of murrelets at a distance of ≤200 m for greater than a cumulative total of ***12 minutes*** the visit should be rescheduled, unless occupied behavior is observed.

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24 Notes: Record "Begin Visit" and "End Visit" to correspond to appropriate times recorded. Note any other pertinent information that can help to better describe or explain the conditions during the survey visit as they pertain to detectability of murrelets.

25 Survey Visit to Protocol: Circle **Y** (Yes) or **N** (No) to indicate if the survey was conducted following the guidelines of the Pacific Seabird Group protocol. Include the name, affiliation and phone number of the person who is making this statement, often the crew or project leader. To answer this question will involve a review of the survey visit by someone affiliated with the survey effort, who should check the survey form for compliance with the protocol, and possibly speak with the observer. The review is not to be done by the observer. An affirmative response does not necessarily imply that the entire survey effort was acceptable or that regulating or evaluating agencies will find the survey to be valid. To aid with answering this question, the following checklist should be completed for each survey:

- ❑ Survey began on time (at least 45 minutes before sunrise)
- ❑ Survey continued uninterrupted for at least 2 hours
- ❑ Vertical visibility to 1 canopy height was not impeded for >12 minutes total
- ❑ Horizontal visibility to 100m was not impeded for >12 minutes total
- ❑ Audibility to 200m was not impeded for >12 minutes total

Survey Activity Page Instructions

Item #

1 Detections - Page Total: Enter the total number of ***murrelet detections***; **every** detection should have a detection number. This is the total number of detections per single-sided page.

2 Page Number of the total number of pages, including maps.

3 Initials: Initials of observers' full name, consistent with the cover page.

4 Month, Day, Year: Date of survey visit. Use 2 digits for Month, Day, and four digits for Year (e.g., May 10, 2000 = 05/ 10/ 2000).

5 Area Name: Name of survey area being surveyed.

6 Stratum Name / No.: Stratum name or number from which survey visit is conducted. Each survey stratum should have a ***unique*** number or alphanumeric identifier.

7 Station Number: Station number from which survey visit is conducted. Each survey station should have a ***unique*** numeric identifier relative to a survey stratum.

8 Units of Measure: Indicate measurement used for all horizontal distances. Circle either **U.S.** or **Metric**.

SURVEY ACTIVITY: Record details of murrelet detections in this table. A detection is defined as the visual or auditory observation of one or more murrelets ***acting together*** in a similar manner and initially occurring ***at the same time***.

- A "5 Second Rule" is applied to distinguish between separate detections. It may be helpful to count "1 one thousand, 2 one thousand, etc."
    - If a murrelet detection is **auditory**, 5 seconds of silence must pass in order to classify the next murrelet sound as a new detection, unless the next detection is clearly made by a different, unassociated individual
    - If a **visual detection** of a murrelet is lost from view for more than 5 seconds, the next sighting is a new detection, even if it is obviously the same bird(s).
- If two or more groups of murrelets coalesce into one larger group, record data on a separate line for each group and write, e.g., "detect. # 10 and detect. # 11 joined", in the Notes column. Assign each detection its own unique detection number. Refer to the definition of a detection above.

- If one group of murrelets split into two or more separate groups of birds, each new subgroup is still considered part of the original detection, but each is recorded on a separate line as follows. Prioritize the subgroup with the lowest canopy height first. If all subgroups are at the same canopy height, then prioritize circling behavior over non circling. Write, e.g., "detect. # 5 split", in the Notes column to link birds associated with the same detection. Assign the same

detection number to both lines of data, since all the birds were initially part of the same group, and thus only constitute one detection. Each subgroup will have the same Time, and Initial Detection and Flight Directions, but likely will have differing Heights, Closest Distances, and Depart and Final Directions. Thus each subgroup will need a separate line to record all the relevant data.

9 Detection #: Each separate ***murrelet detection*** is sequentially numbered one per line as it occurred throughout the survey visit. When mapping the detections, use the detection numbers to cross reference the corresponding line entry. Number only the prioritized subgroup if a group of birds split, because the whole occurrence is considered one detection. Line out the Detect. # column for all associated subgroups. See the Survey Activity section above. Do NOT enter a detection number for any non-murrelet detections or other entries such as detections of other species, or noting when the survey started and ended.

10 Time: Record the time in 4-digit "24 Hour Time" at the beginning and end of survey and for all murrelet detections. .

- **U** (unknown) is entered if detection time was not recorded.

11 Initial Detection Direction: Record the direction where the murrelet is first detected ***relative to the observer***. The direction is recorded at a minimum of 45 degree increments (e.g., N = North; SW = Southwest; E = East).

- **U** (unknown) is entered if initial detection direction was not identified. Without this information, the detection cannot be mapped.

- If a bird is seen landing, perching, or flying into or out of a tree or stand of trees, a stationary detection is heard, or an area of concentrated activity is detected, an azimuth compass bearing for that location (e.g., "145" = 145 degrees) is preferred.

12 Type: Record the detection type using the following codes: **H** = Heard only [auditory sound(s) with no visual observation]; **S** = Seen only (visual observation with no auditory sounds); **B** = Both Seen and Heard (visual observation with accompanying auditory sounds).

13 Auditory: Call types have been assembled into call groups based on their sounds. Review recordings of Marbled Murrelet vocalizations and other sounds to assist with identification. Recordings of other forest bird calls/songs that may have similar sounding notes should also be reviewed periodically.

14 Vocal (vocalizations): Refer to Appendix E for a description of different murrelet calls.

15 K #/M: Record the number (1-5) of *Keer* calls heard for each detection. When more than 5 keers, record M (for multiple).

16 Other Vocs: If “Groan” (G) or “Whistle” (O) calls are heard, simply enter the associated code. More than one code may be entered.

"**G**" = Groan group (longer, variable groans formerly known as alternate calls); and the "**O**" = Whistle group (longer, variable whistle). Birds most often grade their calls between two of these groups within a series or bout of calling.

17 Other (non-vocal sounds): In addition to the vocal sounds described above, there are two other auditory sounds attributed to marbled murrelets. These non-vocal sounds are Wing sounds or wing beats = "**W**", and Jet sounds associated with aerial or power dives = "**J**". Record all types heard for each detection.

OL (Overlapping vocal/non-vocal): Indicate **Y (Y**es) or **N (N**o) if overlapping calls/non-vocal sounds are heard as part of the detection. Overlapping calls are an indication that multiple birds are involved with a detection. This should not be confused with multiple calls that are not overlapping.

- A **solid line ("---")** for "not applicable" is entered in columns that do not apply. Seen only detections do not include an auditory element, i.e., a visual detection with no vocalization or other auditory sounds.

18 # of Birds Seen: Enter the number of birds ***visually observed***.

- If 2 or more groups of murrelets join into 1 group, record data on a separate line for each group and write, e.g., "Detect. #X and Detect. #X1 joined", in the Notes column. Assign each detection its own unique detection number.

- If one group splits into a separate group of birds, then each subgroup is part of the original detection, and each is recorded on a separate line observing the prioritization procedures outlined above under the SURVEY ACTIVITY heading. Each subgroup will have the same Time and Initial Detection Direction. Assign the same detection number to both lines of data.

- A solid line ("---") for "not applicable" is entered for heard only detections.

19 Behavior: Record the behavior type of the bird(s) according to the following codes:

C = Bird(s) seen circling over the forest at > 1.0 canopy height. This behavior includes flight paths that deviate from a straight line, such as full, quarter, and half circles, or angular turns ≥45 degrees.

B = Bird(s) seen circling at or below the forest canopy, i.e., ≤ 1.0 canopy height. This behavior includes flight paths that deviate from a straight line, such as full, quarter and half circles, or angular turns ≥45 degrees.

F = Bird(s) seen flying in a straight (≤ 45 degrees) flight path over the forest at > 1.0 canopy height.

T = Bird(s) seen flying through in a straight flight path at or below the forest canopy, i.e., ≤ 1.0 canopy height.

L = Bird(s) seen landing in, perching, or departing from a tree. This is a rare event.

S = Bird(s) heard emitting ≥ 3 calls from a fixed point in a tree within 100 m (328 feet) of the observer. This is a very rare and unusual event.

U = Bird(s) behavior unknown, i.e., bird(s) seen but behavior not identified, or canopy height not quantified, or detection was heard only and was not stationary.

20 Initial Flight Direction: This is the direction that the murrelets are seen heading when initially detected, i.e., ***the direction the birds are traveling when first detected***. This information allows for accurate mapping of visual detections, and compliments the Bird Depart Direction data. Enter direction in a minimum of 45 degree increments (e.g., N = North; SW = Southwest, etc.).

- U (unknown) is entered for any auditory detections because flight directions are often difficult to correctly identify.

21 Initial Distance to Birds: Enter an estimated horizontal distance to the murrelet(s) when first detected. This information is useful for mapping flight paths.

22 Bird Height: This is determined from ***visual*** observations only. Enter an estimate of bird height in decimal units based on bird location ***relative to the height of the forest canopy***, i.e., the tallest trees within the Survey Area that are observable from the survey station. The height of the ***tallest observable tree*** is equivalent to a unit of 1.0 canopy height. If a bird was seen flying halfway beneath the height of the tallest observable tree, the bird height is "0.5 canopy heights." A bird seen flying over the canopy at one quarter the height of the tallest tree observed is at "1.25 canopy heights."

- If a detection is seen "at or below" canopy height, but an actual height was not determined, enter < 1.0 canopy heights in the Notes section.

- If a bird is only seen flying straight or circling over a clear-cut or water adjacent to the survey stratum, project the height of the tallest tree observable to determine the bird's height. Indicate in Notes if the bird is only seen over these substrates.

- U (unknown) is entered if the bird(s) were seen but the height was not quantified.

- A solid line ("---") for "not applicable" is entered for heard only detections.

23 Closest Distance to Bird(s) Seen: Record the closest horizontal distance from observer to the murrelet(s). A bird flying directly overhead is equivalent to a horizontal distance of zero. Distances are recorded only for ***visual*** detections. Most visual detections are within 100 m (328 feet). ***Indicate units of measurement*** at top of the column.

- For ***heard only*** detections, a solid line **"----"** is entered in the Closest Distance to Bird(s)

Seen column

24 Loudness: For heard detections, enter one of the following codes, based on the intensity of the sound: **L** = Loud (typically 0-50m); **M** = Moderately loud (typically >50m to 150m); **F** = Faint/distant (typically >150m).

- Unless the observer has information to the contrary, for the purpose of mapping, "loud" detections will be mapped at 25 m (82 feet) from the observer; "moderately loud" detections will be mapped at 75 m (246 feet) from the observer; and "faint" detections will be mapped at 200 m (656 feet). Most detections are audible only within 200 m (656 feet). The observer should provide, in the Notes section, any additional information that helps interpret distance. E.g., a faint call heard up high directly overhead should not be mapped at 200 m.

- U (unknown) is entered if the distance is seen but not quantified.

25 Depart Flight Direction: The direction the murrelet was last detected heading, i.e., ***the direction the bird(s) was traveling when last detected***. Enter direction in a minimum of 45 degree increments (e.g., N = North; SW = Southwest, etc.).

- U (unknown) is entered for any auditory detections because flight directions are often difficult to correctly identify.

26 Final Detection Direction: The ***final*** direction the murrelet was detected ***relative to the observer***. The direction is recorded at a minimum of 45 degree increments (e.g., S = South; NE = Northeast; W = West).

- U (unknown) is entered if the final direction is not identified.

27 Notes/other species: Enter brief notes here. Indicate "Begin Survey" and "End Survey" and be sure to enter the corresponding time in the Time column. Alpha codes for other species can be obtained here: https://www.birdpop.org/docs/misc/Alpha_codes_eng.pdf. Use the *Additional Notes* section for more detail.

28 Additional Notes: Enter corresponding detection #. Additional information which can help to concisely describe and map a detection is entered here. For example: groups of birds that split or join other birds; unusual observed behavior; flight path directional information ("circled clockwise" or "counter clockwise"). Or if a dive is seen, record full details of the dive flightpath here. Include references to proximity of murrelet flights to outstanding features on the landscape that may be useful for accurate mapping of detections.