**STAFF REPORT**
**Clallam County Department**
**of Community Development**

**Date:** April 18, 2018
**To:** Board of Clallam County Commissioners
**From:** Steve Gray, Deputy Director/Planning Manager
**Subject:** Draft Shoreline Master Program Update - Channel Migration Zone Mapping and Regulation

Dynamic physical processes in rivers can cause river channels in some areas to move or "migrate" over time. The natural meander patterns of stream channels are the result of the dissipation of energy of flowing water and the transportation of sediment. The area within which a river channel is likely to move over a period of time is referred to as the channel migration zone (CZM). Since the ground within a CMZ is subject to erosion, it represents a hazardous area for development. Roads, pipelines, buildings (e.g., homes), and other property are all at risk within a CMZ. Protecting development within a CMZ can alter natural processes and adversely impact critical salmon habitat.

Channel migration can occur gradually, as a river erodes one bank and deposits sediment along the other. Erosion occurs when the stream has sufficient energy to cut into a bank, so it is dependent on flow conditions and the resistance of the bank material. Channel migration also can occur abruptly, such as cases of channel widening associated with large floods or channel downcutting ("incision") that oversteepens and destabilizes stream banks. Abrupt migration also occurs when the stream takes another path within its floodplain, typically because it offers less resistance (for example, a more direct path or a way around an obstruction). This circumstance is referred to as an 'avulsion.' While areas susceptible to avulsions can be identified, the timing of an avulsion depends on flood events and debris accumulations that are less predictable.

The consequences of an area being eroded depend on who and what is exposed to erosion and how vulnerable they are to damage by erosion. Risk to life may occur during an extreme flood that drives very rapid lateral erosion of the channel or a sudden change of course through avulsion. The consequences for property and infrastructure depend on the nature of the assets that are potentially in harm's way.

## State SMP Update Guidelines Related to CMZs

The Washington State Shoreline Master Program guidelines, administered through the Washington State Department of Ecology (Ecology), state that the general location of channel migration zones are to be identified as part of an inventory of shoreline conditions (WAC 173-26-201(3)(c)(vii)). The SMP Guidelines define the channel migration zone (CMZ) as: "The area along a river within which the channel(s) can be reasonably predicted to migrate over time as a result of natural and normally occurring hydrological and related processes when considered with the characteristics of the river and its surroundings." WAC 173-26-020.

The purpose of identifying channel migration zones (CMZ) is further described in the Ecology rules governing flood hazard reduction in the general master program provisions (WAC 173-26-221):

> "Over the long term, the most effective means of flood hazard reduction is to prevent or remove development in flood-prone areas, to manage stormwater within the flood plain, and to maintain or restore river and stream system's natural hydrological and geomorphological processes.
>
> Structural flood hazard reduction measures, such as diking, even if effective in reducing inundation in a portion of the watershed, can intensify flooding elsewhere. Moreover, structural flood hazard reduction measures can damage ecological functions crucial to fish and wildlife species, bank stability, and water quality. Therefore, structural flood hazard reduction measures shall be avoided whenever possible. When necessary, they shall be accomplished in a manner that assures no net loss of ecological functions and ecosystem-wide processes.
>
> The dynamic physical processes of rivers, including the movement of water, sediment and wood, cause the river channel in some areas to move laterally, or "migrate," over time. This is a natural process in response to gravity and topography and allows the river to release energy and distribute its sediment load. The area within which a river channel is likely to move over a period of time is referred to as the channel migration zone (CMZ) or the meander belt. Scientific examination as well as experience has demonstrated that interference with this natural process often has unintended consequences for human users of the river and its valley such as increased or changed flood, sedimentation and erosion patterns. It also has adverse effects on fish and wildlife through loss of critical habitat for river and riparian dependent species. Failing to recognize the process often leads to damage to, or loss of, structures and threats to life safety.
>
> Applicable shoreline master programs should include provisions to limit development and shoreline modifications that would result in interference with the process of channel migration that may cause significant adverse impacts to property or public improvements and/or result in a net loss of ecological functions associated with the rivers and streams." WAC 273-26-221(3)(b).

WAC 173-26-201(3)(c) states that local government shall, at a minimum, and to the extent such information is relevant and reasonably available, collect the following information: general location of channel migration zones, and floodplains. Ecology interprets this requirement to mean that a channel migration zone map will be developed.

The SMP Guidelines provided limited guidance for collecting information on the general location of channel migration zones:

> "The channel migration zone should be established to identify those areas with a high probability of being subject to channel movement based on the historic record, geologic character and evidence of past migration. It should also be recognized that past action is not a perfect predictor of the future and that human and natural changes may alter migration patterns. Consideration should be given to such changes that may have occurred and their effect on future migration patterns.
>
> For management purposes, the extent of likely migration along a stream reach can be identified using evidence of active stream channel movement over the past one hundred years. Evidence of active movement can be provided from historic and current aerial photos and maps and may require field analysis of specific channel and valley bottom characteristics in some cases. A time frame of one hundred years was chosen because aerial photos, maps and field evidence can be used to evaluate movement in this time frame." WAC 173-26-221(3)(b).

The SMP Guidelines also identify channel migration zones as critical freshwater habitats (WAC 173-26-221(2)(c)(iv)). This is because many ecological functions of river and stream corridors depend on both continuity and connectivity along the length of the shoreline and on the conditions of the

surrounding lands on either side of the river channel. The Guidelines principles direct local governments to regulate uses and development within stream channels and associated CMZs to the extent such areas are in the shoreline jurisdictional area, as necessary to assure no net loss of ecological functions (WAC 173-26-221(2)(c)(iv)(B)(II)).

## Relationship to Other Requirements

State forest practice regulations define the CMZ as an "area where the active channel of a stream is prone to move and this results in a potential near-term loss of riparian function and associated habitat adjacent to the stream, except as modified by a permanent levee or dike. For this purpose, near-term means the time scale required to grow a mature forest...." WAC 222-16-010.

The National Marine Fisheries Service (NMFS) Biological Opinion declared the Federal Emergency Management Agency (FEMA) floodplain management program results in a "take" of Puget Sound Chinook salmon, steelhead and Orca whales (NMFS 2008). FEMA lists Shoreline Master Program updates as a reasonable and prudent alternative to implementing the channel migration requirements of the biological opinion.

## CMZ Mapping in Clallam County

Current CMZ mapping and supporting documents are summarized in Table 1. Ecology is responsible for managing SMP updates and providing technical assistance to local communities completing SMP updates. As part of SMP technical assistance, Ecology and its partners mapped the general location of CMZs within Kitsap, Mason, Clallam and Skagit Counties. In Clallam County, general CMZs were mapped for over 300 miles of streams. Funding was provided to Ecology through a US Environmental Protection Agency (EPA) grant. As summarized in Table 1, the maps and methodology were compiled in 2011 and 2013 in two Draft Channel Migration Assessment Reports and a 2013 supplemental analysis of the CZM at the mouth of Morse Creek. The mapping was conducted by trained geomorphologists, reviewed by three licensed geologists each with over 25 years of geomorphology expertise, and approved by Ecology consistent with the Quality Assurance Project Plan (QAPP) developed for the EPA grant. Ecology is in progress of officially finalizing these Reports, but it is not anticipated that the general CMZ mapping will change or additional analysis conducted.

Ecology did not map the potential CZM for the Dungeness River. This is because the Jamestown S' Klallam Tribe had already completed a channel migration assessment (see Table 1) in 2008 that used similar methodology, and also consisted of review of a much large historic record of aerial photos and maps.

The Clallam County Critical Area Code (CAC), Chapter 27.12 CCC, regulates new development within and adjacent to the mapped general CZM. The CZM is designated as a landslide hazard area in the CAC and subject to standard 50-foot buffer width from the edge of the CMZ (CCC 27.410 and .415). If development is located within or near the County's mapped CMZ, a channel migration assessment/geotechnical report is generally required to determine the edge of the CMZ.

The potential CMZ mapped in the more recent Ecology studies for many river reaches subject to the SMP and Jamestown S'Klallam Tribe maps for the Dungeness River include an erosion hazard buffer as part of the mapping of the CMZ. This "erosion hazard area represents areas where the channel may not have been historically, but may move in the future based on ground erodibility, evidence of migration in similar areas, and rates of historic migration. The erosion hazard zone also includes valley hillslopes in valleys that are actively forming. Where a channel cuts into a valley margin, it will tend to over-steepen the hillslope and create an increased risk of landslide that can pose a significant threat to areas that may be situated outside of the CMZ or flood hazard zone. Therefore mapped CMZs may affect higher ground susceptible to erosion driven by the stream.

**Table 1 – Summary of General Channel Migration Zone (CMZ) Mapping in Clallam County**

| Source | Title/Document | Description |
|---|---|---|
| Clallam County | Channel Migration Zone Map Layer. Developed in the mid-1990's by the County's Habitat Biologist at the time. | This is the current CMZ data layer available on the County's on-line critical area map layers. It is a generalized map that does not cover all rivers reaches subject to the SMP. The CMZ mapping considered available mapped soils formed in alluvium, topography (USGS Topographic maps), current stream meander, and judgement of the County's Habitat Biologist. For example, appears that areas between river meanders that were characterized by mapped soils formed in alluvium and not constrained by topography were mapped as CMZ. No associated written study or methodology can be found. It did not include analysis of LiDAR. |
| Jamestown S' Klallam Tribe | *Delineation of the Dungeness River Channel Migration Zone-River Mouth to Canyon Creek*; by Byron Rot and Pam Edens, Jamestown S' Klallam Tribe, October 1, 2008. | This report provides background and methodology for mapping of the potential CMZ along the Dungeness River by the Jamestown S' Klallam Tribe to assist Clallam County in update of the County's Critical Areas Code and SMP. CMZ mapping included analysis of aerial photos, LiDAR/topographic data, geology, soils and other information. See report for description of complete methodology. |
| WA. Department of Ecology | *Draft Channel Migration Assessment Clallam County*; prepared by Cardno Entrix-GeoEngineers for Washington Department of Ecology; December 2011. | This report provides background and methodology for mapping of the potential CMZ by Ecology for all or select reaches of the following County SMP streams located in WRIA 18 & 19 (Drain to Strait of Juan de Fuca): Sooes River, Sekiu River, Hoko River, Herman Creek, Little Hoko River, Clallam River, Pysht River, Deep Creek, E. & W Twin Rivers, Lyre River, and Morse Creek. This report does not map the CMZ for the Dungeness River, since an analysis was previously done by the Jamestown S'Klallam (see below). |
| WA. Department of Ecology | *Memorandum: Revised Draft CMZ Boundaries for Lower Morse Creek, Clallam County;* prepared by Patricia Olson, PhD, LHD, Senior Hydrogeologist for the Washington Department of Ecology; dated January 2, 2013. | Revises the CMZ map for Lower Morse Creek (north of US 101). Includes further classifying into two categories: Higher Potential Hazard CMZ and Lower Potential Hazard CMZ. CMZ mapping included analysis of aerial photos, LiDAR/topographic data, geology, soils and other information. See report and memo for description of complete methodology. |
| WA. Department of Ecology | *Draft Channel Migration Assessment Clallam County*, prepared by GeoEngineers for WA. Department of Ecology (April 2013) | This report provides background and methodology for mapping of the potential CMZ by Ecology for all or select reaches of the following County SMP streams located in WRIA 20 (Drain to Pacific Ocean): Quillayute River, Bogacheil River, Calawah River, Sitkum River, Elk Creek, Soleduck River, Shuwah Creek, Bockman Creek, Beaver Creek, Bear Creek , Camp Creek, Dickey River, Colby Creek, Thunder Creek, Skunk Creek, Crooked Creek, Big Creek, Umbrella Creek, Snag Creek, and Pilchuck Creek. CMZ mapping included analysis of aerial photos, LiDAR/topographic data, geology, soils and other information. See report for description of complete methodology. |

## Limitations of Current CZM Mapping and Studies

These maps are not intended for site-specific design purposes. The current CZM maps represent a planning-level assessment and serve as a basis for delineating areas of potential channel migration. The boundary line is an approximation—it does not represent a sharp boundary where one side of the line is subject to channel migration, and the other side is immune. The delineated general CMZs by Ecology, the Tribe and County are intended to be used as a guideline for identifying areas where site specific or more detailed CMZ studies should be conducted. Refer to the CMZ reports summarized in Table 1 for information on appropriate use, CMZ mapping methodology, and limitations.

Risks to people, property and infrastructure related to channel shifting within the CMZ may be defined as the probability that the river will erode a specified area of land multiplied by the consequences for people, property and infrastructure should it do so. Current general CMZ delineations represent the potential area that may be subject to channel migration or occupied due to an avulsion by the river at some time in the future. However, the forecasting period is unspecified. It is unclear whether erosion is imminent, likely in the foreseeable future or possible only in the distant future. The probability of erosion is neither steady through time, nor uniformly distributed throughout the CMZ. Current CMZ maps in Clallam County are not based on risk probability (except for the Ecology supplemental "high" and "low" risk CMZ mapping at the mouth of Morse Creek).

## Prior Requests from the County Commissioners

To date, in review of the Draft SMP and public comments received, the Commissioners requested the following:

1. Send a letter to Ecology with questions regarding CMZ mapping along west-end rivers addressing issues such as:
   - Impact of "erosion hazard buffer" factor on outer CMZ boundary.
   - Rationale for wide CMZ's on river reaches that show no or minimal channel movement over past 20-years characterized by incised/confined channels, mature tree stands, and/or significant topographic changes.
   - Address public comments received on CMZ mapping.

   **Status:** A letter was sent to Ecology on February 18, 2018. The County is awaiting a response from Ecology.

2. Update Draft SMP requirements based on the a 3-Step CMZ Assessment Review Process:
   - Level 1: County Review of applicant CMZ Checklist Regarding Site Conditions, available information (e.g. aerial photos, CZM studies, LiDAR, etc...), consult with state agencies (e.g., Dept. of Natural Resources), and a site visit.
   - Level 2: If required by County (after Level 1 Review), require CMZ assessment report by qualified professional to consider aerial photos, topographic maps, and other existing information.
   - Level 3: If based on Level 2 Assessment, the qualified professional determines channel migration likely; a field review is required to confirm the presence of a CMZ.

   **Status:** Attachment A to this staff report contains draft revisions to Section 7.14.10 of the Draft SMP for the Board's consideration.

3. Research methodology and costs for improving CMZ mapping:
   - Target "risk based" CMZ mapping methodologies (e.g., high, moderate, low CMZ potential).
   - Obtain information on potential costs of mapping and explore potential grant funding opportunities.
   - Identify priority river reach segments for CMZ mapping based on existing development and development potential.
   - Consult with WA. Department of Natural Resources (DNR) related to data and possible technical assistance on improved CMZ methodology.

   **Status:** This will need to be part of a future effort to pursue improving CMZ mapping.

4. Remove the mapped potential CMZ on the Draft Shoreline Environmental Designation (SED) maps in Exhibit A of the Draft SMP (September 2017).

   **Status:** The mapped potential CMZ will be removed from the SED maps in the revised SMP to be considered for County adoption together with other proposed amendments.

Respectively submitted,

Steve Gray
Deputy Director/Planning Manager

# ATTACHMENT A

*Proposed revisions to Section 7.14.10 of the Draft SMP for County Commissioner consideration*

10. Channel Migration Zone Protection Standards: ~~If County maps indicate that a potential channel migration hazard exists on or adjacent to a proposed use or development site, the applicant shall either:~~

a. Channel Migration Zone (CMZ) Mapping. ~~Locate the proposal landward of the potential channel migration hazard area as indicated on the map which already includes an erosion hazard buffer; or~~ Clallam County shall make available to the public maps and supporting documents (e.g., methodology) of the potential CMZ based on best available information. These maps currently include the following:

i. Delineation of the Dungeness River Channel Migration Zone-River Mouth to Canyon Creek; by Byron Rot and Pam Edens, Jamestown S' Klallam Tribe, October 1, 2008.

ii. Final Channel Migration Assessments for Clallam County, prepared by Cardno Entrix – GeoEngineers, for Washington Department of Ecology.

These maps and supporting documentation shall be advisory and used by the Administrator to provide guidance in determining the applicability of the standards of this Program to a property. These maps shall be updated as new information becomes available.

b. CMZ Checklist and Review. Applicant's that propose new shoreline uses and development in the mapped potential CMZ within the shoreline jurisdiction shall submit a completed CMZ checklist available from the Administrator with their shoreline application. The Administrator will perform and document the results of the following steps to determine whether to require the applicant to prepare a CMZ assessment report:

i. Review the submitted CMZ checklist and any other supporting information provided by the applicant;

ii. Consult maps and related supporting data bases and reports on the location and extent of the potential CMZ that are available to the public;

iii. Review whether any significant channel movement has occurred between available County aerial orthophoto data layers since Year 2000.

iv. Consult with state resource agencies of jurisdiction and/or expertise such as Department of Natural Resources, Department of Ecology and Department of Fish and Wildlife; and

v. Conduct a site visit to observe and document (e.g., photos) current conditions and evidence of channel migration.

~~a.~~c. CMZ Assessment Report. If required by the Administrator, the CMZ assessment report ~~Submit a channel migration zone study,~~shall be prepared by a geologist, engineering geologist, ~~or~~ professional engineer licensed in the state of Washington, or other qualified professional ~~with at least 5 years of experience in analyzing channel response in the fluvial systems of the Pacific Northwest,~~ that demonstrates the following:

i. The parcel on which the development or use is proposed is effectively protected (disconnected) from the channel movement due to the existence of permanent levees maintained by public agencies (not all roads and levees will be considered disconnection points); or

ii. The proposed use or development site has minimal risk of channel migration as indicated by the existing channel type, land cover (and low likelihood of future alterations in land cover); surficial geology, low soil erosion potential; lack of evidence of likely avulsion pathways (including areas upstream of, but proximate to, the site); low inundation frequency(ies); whether channel movement has occurred between aerial photo years; and other available information. The assessment shall include a review of existing CMZ maps and studies; available data (e.g., aerial photos) regarding historical channel locations at the site; available topographic data (e.g., LiDAR, USGS topographic maps); identification of the site within a broader geomorphic reach of the river system, and the general characteristics of that reach; description of existing channel type, existing channel alterations and likelihood of future alterations with changes in land cover; surficial geology, soils and erosion potential; and geotechnical setbacks relating to erosion at the toe of adjacent slope(s). The approach to assessing local migration shall be generally equivalent to the methods detailed in "A Framework for Delineating Channel Migration Zones" (Ecology Publication # 03-06-027), or similar method approved or sanctioned by Ecology.

The determination of minimal risk shall also consider the typical lifespan of the proposed use and development (e.g., 100 years for a single-family home); the ability and ease of moving the use or development (e.g., RV or mobile home); whether the use or development is temporary or permanent; and the likely effectiveness of applicable shoreline and critical area (e.g., wetlands) buffers between the stream and the proposed location of the use and development. The CMZ assessment shall also evaluate the risk of whether it would be reasonably foreseeable that the proposed use or development would require new shoreline stabilization or interrupt the process of channel migration.

d. CMZ Field Determination. If a qualified professional determines that the proposed use or development is at risk to channel migration based on the CMZ assessment above, a field review is required to confirm the presence of a CMZ, and field observations shall be documented in the CMZ assessment report. Field observation finding shall include:

i. Date of the site visit;

ii. Who conducted the field review and their title/position;

iii. Distance and location of channel walked;

iv. Length and location of CMZ boundary delineated;

v. Presence of avulsion hazard and/or erosion hazard areas;

vi. Description of method(s) used to determine CMZ presence, CMZ outer edge delineation and marking (flagging, other);

vii. Description and location of required shoreline and critical area buffers (e.g., wetlands) pursuant to Chapter 6 and 7 of this Program between the ordinary high water mark and the proposed use and development; and

viii. Other applicable information.

e. New Uses and Development Inside CMZ. Based on the results and recommendations of the channel migration zone assessment, the Administrator ~~may~~shall prohibit or limit use or development within a channel migration zone when such uses or development would likely be subject to channel migration or when it would be reasonably foreseeable that the

use or development would require shoreline stabilization or interrupt the process of channel migration. In addition, based on the findings and recommendations of the CMZ assessment report, or a habitat management plan required by this Program, the Administrator may ~~and/or~~ require a buffer of undisturbed natural vegetation from the edge of the channel migration zone to retain both a safety and habitat buffer if and when the channel migrates to the channel migration zone edge. The exception would be new uses and development that may be appropriate (e.g., water dependent uses, restoration projects, etc…) and/or may be necessary (e.g., roads, utilities) within the CMZ that are otherwise authorized and consistent with this Program, including providing mitigation to address impacted ecological functions and processes.

## 7.15 Regulations – Frequently Flooded Area Designation and Mapping

1. Designation and Mapping: All lands classified as floodway, floodplain or special flood hazard areas in the Federal Emergency Management Agency report titled "The Flood Insurance Study for Clallam County" dated February 23, 2001, as now or hereafter amended, with accompanying Flood Insurance Rate and Boundary Maps, are designated as frequently flooded areas. The study and maps are on file at Clallam County. When base flood elevation data has not been provided in the Flood Insurance Study, the Administrator shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from the Federal Emergency Management Agency, Washington State Department of Ecology, or other qualified source. Where base flood elevation data and floodway delineation are not available either through the Flood Insurance Study or from a qualified source, historical data, high water marks, photographs of past flooding, etc., shall be used to determine base flood elevations. Special Flood Hazard Areas shall be delineated by engineering studies that meet the specifications 44 CFR § 65 and approved by FEMA and then adopted by Clallam County. The only method to alter data or maps related to special flood hazard areas is through an officially processed map change, through a physical map revision, a county-wide remapping, or a Letter of Map Change (LOMC) submitted to FEMA and approved. Qualified professionals may submit these studies to FEMA to alter the location of the Special Flood Hazard Areas through the Letter of Map Change (LOMC) process, with the concurrence of the Administrator.

## 7.16 Regulations – Frequently Flooded Area Protection Standards

1. The standards of this Program, including this section, shall be implemented along with the International Building Code and Clallam County Code 21.01.040 to protect frequently flooded areas because the jurisdiction of the shoreline master program covers the full extent of the floodplain and is therefore coincident with the frequently flooded areas.

2. The standards of this section and other applicable provisions of this Program shall apply to all new uses and developments occurring within the floodway, floodplain or special flood hazard areas, including flood control structures regulated in Section 4.4 of this Program.

3. Critical facilities shall be prohibited within areas designated as frequently flooded. Where linear critical facilities must cross frequently flooded areas, reasonable and practicable alternative alignments which minimize flood hazard shall be considered and preferred; any necessary crossing for linear critical facilities shall be elevated and/or flood-proofed, sited to minimize hazard and ecological impacts, and otherwise designed and maintained to minimize flood hazards.