

**COPPER RIVER WATERSHED PROJECT  
CORDOVA, ALASKA**

**CORDOVA STORM-WATER STUDY  
– PHASE 1  
Design Study Report**

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## **INTRODUCTION AND BACKGROUND INFORMATION**

The watershed of the Prince William Sound is one of the critical and most productive natural habitats for salmon and other aquatic organisms in Alaska. Some of the main contributing portions of this watershed include Orca Inlet, Copper River and Eyak Lake, surrounding the City of Cordova. Local population here heavily relies on subsistence and commercial fishing. But human activities and population growth gradually infringe on this valuable habitat and impact it. Based on the Eyak Lake AMSA cooperative Management Plan (1985), only 15.57 acres of beach spawning habitat was available at Eyak Lake. The available spawning areas and habitat health are affected by limiting sediment passage to the lake, as well as by pollution. Proximity of urban development such as the one occurring in Cordova is without a doubt affecting the fish and other aquatic organisms' habitat.

This project was commissioned by the Copper River Watershed Project. The (CRWP), a non-profit organization, is working jointly with the community and fishing industry leaders to revive and maintain the productivity and quality of the aquatic habitat of the Copper River Watershed. The CRWP has procured funding and commissioned several projects to sustain and improve the conditions of the aquatic habitat.

So far only the first phase of the project was conducted. This Phase 1 is funded by a grant received from the Alaska Department of Environmental Conservation. The grant was provided to conduct engineering studies and produce a report on storm-water treatment alternatives for Cordova, the effect of pollution on the aquatic habitat; especially that of Orca Inlet and Eyak Lake, water bodies directly affected by the city's development, industry, and activities.

The Copper River Watershed Project is also conducting a public education campaign in conjunction with the project, and is based on the report findings. This campaign is titled: "Don't Run-off Salmon", and is to raise awareness regarding the storm-water pollution, its effect on salmon habitat, and what communities in the Copper River Watershed can do to keep storm-water clean.

The Phase I Report contains the information and studies that cover the first two steps of the standard Watershed Planning and Implementation Process (by EPA) for the City of Cordova. The steps include:

Step 1 – Building Partnerships:

- Identify key stakeholders
- Identify issues
- Set preliminary goals
- Develop indicators
- Conduct public outreach

Step 2 – Characterize the Watersheds:

- Gather existing data and create a watershed inventory
- Identify data gaps and collect additional data if needed

- Analyze data
- Identify causes and sources of pollution that need to be controlled
- Estimate pollutant loads

This phase of the project however did not include any sampling, testing, or specific data analysis, due to budget and scope limitations. This work will be performed in the follow up phase(s). Recommendations for additional work needed have been included in this report (refer to section “Recommendations for Follow up Work and Studies”).

As stated above, this study only addresses the first steps of the planning process:

- a. Its intent is to assist the client (CRWP) in building partnerships, identifying stakeholders and conducting the public outreach
- b. It identified and created an inventory of the specific watersheds.
- c. Pollutant classification is provided
- d. The study identified the information still needed and existing data gaps.
- e. It provides some analysis and identification of potential causes and sources of pollution.

## **CORDOVA STORM-WATER STUDY GOALS, LIMITATIONS, AND LESSONS**

This work was conducted by Bratslavsky Consulting Engineers, Inc. (BCE, Inc.) to assist Copper River Watershed Project (CRWP) with its goal of facilitating Copper River Watershed planning and management, as well as conducting a public education campaign required to gain public and administrative support, and to achieve a joint effort in preventing pollution of the valuable aquatic habitat.

BCE, Inc. and CRWP would like to thank multiple volunteers that assisted the project team in verification of the existing storm drain system, locating various portions of this system point's data around the city with GPS instruments and recording data.

The work for this Phase of the project involved the following:

- a) Developing a city watershed map. This map was based on the most detailed GIS map found for the city of Cordova. Various additional information was put on the map, including, the existing city storm drain system drawings which were digitized that by BCE, Inc., GPS points collected, and other information.
- b) Topographic information available, as well as driving around the city of Cordova and verifying city maps. Drainage patterns and individual stream flows enabled this consultant to draw the actual watershed areas.
- c) Observations and photographs taken around the city are included as examples of pollution sources and hazards. These photos and notes have been included in the body of this report, as well as in the Appendix.
- d) Classification of contaminants has been included in the report, which is based on the general available information and knowledge, potential local sources, and potential contaminants that can be anticipated.
- e) Recommendations for follow up work and studies.

The goal of this study is to analyze the local watersheds and drainage patterns, and the potential effects of the storm water runoff in Cordova. The drainage patterns of the city are fairly complex because of the various bodies of water that surround Cordova, including the Eyak Lake, Odiak Pond, Odiak Slough, harbors, streams and Orca Inlet. The surface runoff is partially diverted by the existing storm water drainage systems that consist of mostly culverts and limited underground piping which have direct outfalls into various bodies of water.

To accomplish this task, the data from a number of sources and studies were compiled and reviewed, including the following documentation:

- AutoCAD and hand drawings of the existing city infrastructure obtained from the City of Cordova Planning Department.
- The existing GIS drawings from the city included limited information only, such as street and business names, and partial topographic information.
- GIS data available as public domain information was obtained from the state of Alaska and USDA Forest Service, and the information was included on the design drawings.
- A hard copy of the manual and Schematic drawings of the storm water drainage network (by others) was digitized by BCE and added to the existing infrastructure drawings.
- Field reconnaissance was conducted by CRWP staff and volunteers, (in December of 2007), where GPS information was collected (in NAD27 datum) for some of the existing storm drain system inlets and outlets, and matched by BCE, Inc. with the drawing information.
- In addition to collection and analysis of the available data, BCE staff provided an onsite reconnaissance in order to identify the drainage patterns and limits for various watersheds. (This reconnaissance through was limited due to heavy snow cover.)
- Information concerning local aquatic habitat was obtained thru site visits, the Eyak Lake AMSA Cooperative Management Plan, interviews with CWRP staff, other organizations, and local officials.
- For more documentation please refer to bibliography section on page 18.

The following limitations apply to the Phase 1 of this project:

- a) All maps were developed based on the existing AutoCAD, GIS, zoning, and other maps available from the City of Cordova, USDA, Forest Service, CRWP, and other sources.
- b) No additional geophysical surveys have been conducted, or possible due to budget constraints.
- c) Existing information available from various sources could not be verified by this consultant due to budget limitations and heavy snow cover. The CRWP and its volunteers assisted in confirmation of the storm drain system parts location, but portions of the drain system not shown on the existing drawings and not visible due to snow cover could not be verified.
- d) It should be noted that no sampling or testing has been done as a part of this project (due to budgetary constraints). This testing is recommended for phases of the project and is informational and described in the last section of the report 'Recommendations for Follow up Work and Studies'.
- e) Data collection was limited due to the snow cover on the ground.

## **CITY OF CORDOVA WATERSHEDS**

The city of Cordova was subdivided, in this study, into nine (9) different Watershed areas, and a watershed map has been created and included in this report (see Appendix 2).

The Nine watersheds (refer to map on sheet E-0) include:

1. East Nirvana Park Watershed
2. Vina Young / Nirvana Park Watershed
3. South Eyak Lake Watershed
4. Odiak Pond Watershed
5. Odiak Slough Watershed
6. South Fill and New Harbor Watershed
7. North Fill Watershed
8. Old Harbor Watershed
9. High School Watershed

The watersheds and their characteristics are described below.

### **1. East Nirvana Park Watershed**

The East Nirvana Park Watershed is located along the north and northwest shore of Eyak Lake and adjoins the Nirvana Park and Vina Young / Nirvana Park Watershed. This watershed is only partially delineated due to the limitation in available survey and existing data. The watershed area measured from the existing maps is approximately 49.2 acres. It drains into the Eyak Lake east of Nirvana Park and along the north shore of the lake.

The majority of the watershed consists of undeveloped heavily forested hill slopes. Development occurs mainly in several areas near the lake shore. The roads in the vicinity have gravel surface, with the exception of the city airfield (which is paved.) Runoff flows into ditches and is concentrated at outfall culverts that combine ditch drainage, and direct live stream flows into the Eyak Lake.

Residential homes, subdivisions and commercial facilities are located along the lake. The primary commercial enterprises are associated with the city airport and aviation companies such as Cordova Air that have hangars and storage buildings with fuel storage on the premises.

Anticipated pollutants include: Due to erosion, natural streams and runoff from roads and developments deposits a lot of sediments, eroded fine-grain sediment (silt & sand), hydrocarbons, and various chemicals.

In the study area the main outfall points are located:

- 1) By the Cordova Air: a culvert discharge flow from a live stream and a nearby ditch line

- 2) Two outfall culverts that drain directly into the Nirvana Park area. These also take both live stream and ditch line runoff.
- 3) No – Name stream to the east brings significant bed load deposition, along with drainage culverts from the adjacent subdivision where major erosion was observed.

The Eyak Lake AMSA Cooperative Management Plan (1985) has identified these outfall areas as rearing and overwintering habitat for juvenile salmon. The report identified the shoreline area around Cordova Air as sockeye spawning habitat. (Please see maps in Appendix 7).

## **2. Vina Young / Nirvana Park Watershed**

The Vina Young/Nirvana Park Watershed is located on the northwest side of the Eyak Lake. It drains the hill slopes above, the low-lying area around the Spruce Grove and McKaughlin Trailer Court, and Vina Young subdivisions. The area of this watershed size approximately 59.0 acres.

The majority of this watershed also consists of undeveloped heavily forested hill slopes. Here again the development occurs in the low-lying area near the lake and on the slopes of lower hills. The main roads in this area have paved surface with some smaller access roads (such as Ingress and Spruce Grove Trailer Court), which are gravel surfaced. Runoff flows into ditches, several stormwater pipes, and low lying areas that are concentrated at culverts that combine storm water and live stream flows then directly outfall into the Nirvana Park area of the Eyak Lake.

The area is mainly older residential. Anticipated pollutants potentially include: hydrocarbons, chemicals, and eroded fine-grain sediment (silt & sand).

A culvert near Nirvana Park discharges flow from the live stream and storm water from the north portion of Lake Street to the head of Nirvana Park. There is another outflow culvert that drains the low-lying area around the two trailer courts between Lake and Chase Streets.

The Eyak Lake AMSA Cooperative Management Plan (1985) has identified these areas as rearing and overwintering habitat for juvenile salmon. Although not mentioned in the AMSA Plan, there has been historic spawning of sockeye observed in this area (as reported by the staff of CWRP).

## **3. South Eyak Lake Watershed**

The South Eyak Lake Watershed is located along the Southwest and Southern shore of Eyak Lake, along the Copper River Highway, and abuts the Nirvana Park and Odiak Pond Watersheds.



This watershed is only partially delineated due to the limitation of the existing available data set. The watershed area measured from the existing data is approximately 15.0 acres and drains into Eyak Lake along the West and South shores of the lake. (It should be noted that the existing GIS data do not pick up the entire undeveloped vegetated hill slope, therefore they have not been included in the area calculated).

Development occurs in the areas adjacent to the lake. The roads in the vicinity have paved surfaces. Runoff flows into ditches and is concentrated at outfall culverts that combine ditch and live streams, and flow directly into Eyak Lake.

Both residential and commercial facilities are located in this area. The residential area is the McLaughlin Trailer Court and private homes along LaFevre and a number other smaller streets. The primary commercial enterprises are associated with Eagle Construction and Cordova Electric Company facilities. Both premises have storage buildings with fuel storage, heavy equipment, and power line components on the premises. Eagle Construction property drains to both Eyak Lake and Odiak Pond.

Anticipated pollutants include: hydrocarbons, chemicals (heavy metals and nutrients), and eroded fine grain sediment (silt & sand).

The main outfall points are located near private residences on LaFevre Street where two (2) culverts discharge storm water flow from the area south of the McLaughlin Trailer Court east of LaFevre Street. Additional surface runoff is dispersed into Eyak Lake from adjacent roadways and developed lots.

According to the Eyak Lake AMSA Cooperative Management Plan (1985), these areas constitute rearing and overwintering habitat for juvenile salmon.

#### **4. Odiak Pond Watershed**

The Odiak Pond Watershed is located to the west of Nirvana Park and South Eyak Lake Watersheds and eventually drains into Odiak Slough. This watershed is the largest of all around the city of Cordova. The area measured from the existing data is approximately 139.0 acres. Odiak Pond outflow is controlled by 3 existing culverts running into Odiak Slough crossing under the Copper River Highway (48", 54" and 60" diameters). These pipes do not drain the pond completely, but serve more as overflow culverts.

Development occurs over the entire watershed. Both residential and commercial facilities are located in this area. Residential areas are the Heney and Burton Trailer Courts, multiple private homes along Lake, Chase and other (from Fifth to Ninth Streets) streets.

Many roads in this watershed have paved surfaces. Runoff flows into ditches along the roads, and is concentrated at direct outfall culverts that combine ditch and live stream flows that discharge directly into Odiak Pond.

The primary commercial enterprises are associated with the Cordova Hospital, Wilson Construction, Eagle Construction, State Maintenance facility, and a US Forest Service camp. There is also a cemetery. Some of the commercial facilities have storage buildings with fuel storage, heavy equipment, and gravel and construction materials storage.

Anticipated pollutants include: hydrocarbons, chemicals (heavy metals and nutrients), and eroded fine-grain sediment (silt & sand).

In this watershed the main outfalls drain directly into Odiak Pond. There are several main outfall areas:

- 1) A storm water discharge that comes into the pond from the hospital parking lot.
- 2) A live stream that flows into Odiak Pond and parallels the Copper River Highway.
- 3) Several small culverts also drain storm water runoff from along the Copper River Highway directly into the Odiak Pond.

The outfall behind the Cordova Hospital appears to bring a lot of heavy metals and nutrients (bog iron formation). The stream and the bottom of the pond at the outfall in this area have a noticeable odor and a bright orange color. Most of the pond was frozen and covered with snow, but it is anticipated that the surface runoff around the pond from adjacent roadways and developed lots produces the same effect.

Under the right circumstances, the Odiak Pond could potentially represent a picturesque wetland, with a natural ability to self-clean and restore wetlands vegetation and habitat. But the presence of heavy pollutants, salts (used for de-icing) metals from untreated runoff and other pollutants is demonstrated by the heavy growth of grasses usually foreign to wetlands. Such grasses are a sign of a damaged or destroyed wetland system. Heavy growth of grasses could be noted in the thawed areas around the pond at storm drain outfalls.

According to the available information, there is anadromous salmon (juveniles) in the pond, utilizing it as overwintering and rearing habitat.

## **5. Odiak Slough Watershed**

The Odiak Slough Watershed is located west of the Odiak Pond, and flows directly into Orca Inlet. This watershed is relatively small in size (based on the division of watersheds), but could be considered a part of the Odiak Pond Complex watershed. The area measured for this watershed is approximately 34.0 acres.

Development occurs over the entire watershed. The roads in the vicinity have both paved and gravel surfaces. Runoff flows into ditches along the roads and is concentrated at outfall culverts; as well as the outflow from Odiak Pond.

Both residential and commercial facilities are located in combined Odiak Watershed. Besides those listed in the description of the Odiak Pond Watershed, other developed included are the residential area to the south of South Second Street and parts of the Heney Trailer Court, and some areas of Whitshed Road. The primary commercial enterprises are those listed in the Odiak Pond Watershed (the rest are residential).

Anticipated pollutants include: hydrocarbons, chemicals, and eroded fine-grain sediment (silt & sand).

The main outfall point is the Odiak Pond. (Three drainage culverts connect it to the Odiak Sloughs). The rest of the storm drainage enters as dispersed surface and subsurface flow.

Anadromous salmon (juveniles) are using the pond as overwintering and rearing habitat along with the rearing habitat in the Slough. Numerous aquatic species and migratory birds use this area during the year.

## **6. South Fill/New Harbor Watershed**

The South Fill/New Harbor Watershed is located on the north side of the South Fill, and drains most of downtown from approximately 4<sup>th</sup> Street west to the New Harbor. The runoff from the north portion of the South drains into the New Harbor area, and then into Orca Inlet.

A large part of the watershed consists of undeveloped hill slopes above the town. The total area of the watershed is measured at approximately 132.8 acres.

Development occurs closer to the water, New Harbor. The roads have both paved and gravel surfaces. Large parking areas have aggregate surface. A large Used Oil Collection Station that includes two storage tanks and a dumpster, is also located on South Fill. While the tanks appear to meet EPA and state requirements for fuel storage (these may need to be inspected, but a detailed tank inspection was not included in the proposal), it was reported that some dispose of the used oil directly into the dumpster nearby.

Storm water runoff from downtown is concentrated and collected into a 60 inch diameter storm drain pipe that empties at the terminus of the South Fill directly into Orca inlet.

Several small culvert outfalls drain the north portion of the south fill into the New Harbor. There is some dispersed flow as well directly shut draining into the New Harbor.

Both residential and commercial facilities are located throughout the downtown and South Fill area, including the gas station, canneries, state and federal buildings, private businesses, large parking areas and residential buildings, all contribute to a wide collection area concentrated into principally one main outfall at the end of the South Fill. This outfall withstands a lot of flushing and drainage, quality of which should be evaluated in the near future.

Cannery buildings and outfalls were not inspected due to time and budget restrictions, and many could not be observed due to snow and ice accumulations. These should be looked into during the future site visits, and checked during the non-winter months and especially during the fishing season.

Anticipated pollutants include: hydrocarbons, chemicals, organic waste, and eroded fine-grain sediment (silt & sand).

Since we do not have historic air photography of the South Fill, one can only assume that the construction of the South Fill may have created the small estuary described above. It still created some amount of habitat that requires protection.

## **7. North Fill Watershed**

The North Fill Watershed is located on the North Fill north of Marine Way, and drains westward from the hill slopes to the east, across the North Fill into Orca Inlet. This watershed measures approximately 82.7 acres.

The roads in the vicinity have both paved and gravel surfaces, in addition to large aggregate surfaced parking areas on the north fill. This area drains primarily westward with no major outflow pipes observed.

Since the ground is mainly gravel/borrow excavation fill, it is fairly porous. The drainage is dispersed along the fill slopes and is apparently not concentrated into several outfall pipes. There is only one known outfall next to the city impound lot with four outfall culverts draining into the Old Harbor.

This area includes commercial facilities, canneries, storage facilities, a Coast Guard lot, Alaska Marine Lines shipping container lot, fuel storage, and city impound facilities. This area has a large amount of old vehicles that can be a major source of petroleum, heavy metals and chemical contaminants.

Anticipated pollutants include: hydrocarbons, chemicals, and eroded fine-grain sediment (silt & sand).

## **8. Old Harbor Watershed**

The Old Harbor Watershed covers the area from the north side of Breakwater Avenue to Marine Way and from the First Avenue to Orca Inlet. This is the smallest watershed measuring approximately 15.8 acres.

The southern portions of the North Fill drain into a number of outfall culverts and into the Old Harbor. The roads in the vicinity have both paved and gravel surfaces. Large aggregate surfaced areas on the North Fill serve as parking areas and storage for the Coast Guard, Alaska Marine Lines, Seafood companies, a boat repair yard, impounded vehicles, equipment, etc.

Most of the storm water collected is directed into the shoreline and along the Old Harbor board walks.

There are several cannery buildings (not inspected by BCE, Inc.) that should be checked during non-winter months or during the fishing season for potential pollution outfall sources and concerns.

Anticipated pollutants include: hydrocarbons, chemicals, organics, and eroded fine-grain sediment (silt & sand).

## **9. High School Watershed**

The High School Watershed is located north of the Odiak Slough, and south of the South Fill watershed. It collects runoff from the high school area and the residential area north of the south portion of the Second Street. It flows directly into Orca Inlet. This watershed is relatively small in size: draining an area of 24.0 acres only.

Although this watershed is small this is one of the most congested watersheds: Development occurs over the entire watershed. The roads in the vicinity, with both paved and unpaved (gravel) surfaces, drain into ditches along the roads.

Both residential and commercial facilities are located throughout this watershed. Businesses located on the south fill include NAPA, an AC store, and a harbor-master office. Large parking areas on South Fill also drain into the estuary area. The downtown area, surrounding the community college, drains into the head of the estuary near Sawmill road. Areas along the southern edge of the high school, the ball fields, and private residences drain to the west - to Orca Inlet.

Anticipated pollutants include: hydrocarbons, chemicals (nutrients and heavy metals), and eroded fine-grain sediment (silt & sand).

All runoff is concentrated into 5 (known) outfall culverts that drain into the small estuary and shoreline south of the South Fill area. Two (2) outflow areas near the head of the estuary concentrate the majority of the storm water into a fairly small area. The others drain west - into Orca Inlet, near the high school.

## **POLLUTION PREVENTION AND CLASSIFICATION OF CONTAMINANTS**

Residents of Cordova and surrounding areas depend on clean water, as it is critical not only for residing health, but also for subsistence, recreation, opportunities for work, such as commercial fishing, food, cosmetics and other industries, for domestic or industrial activities. Located in the Copper River Delta and known for its world class fishing opportunities, this area is considered to have generally pristine waters, which is its distinguishing characteristic and helps make it unique worldwide. Therefore, maintaining good water quality is an important goal for the Copper River Watershed Project and other agencies and community leaders supporting this project.

Clean waters can only be achieved when all sources of pollution in each watershed are restricted and controlled. Taken this into consideration, the goal of keeping the waters clean can be achieved when all resources are mobilized, and everyone is involved and focused on the identified priorities to keep the watersheds clean. Because the task is gigantic, people need to work together to fulfill it and prevent pollution, point source as well as nonpoint source

Nonpoint source water pollution is water pollution that does not come from an end of pipe discharge. It comes with new development, lack of measures and restrictions placed by local government(s) on human activities that could assure clean waters. It is the leading cause of water pollution in Alaska, and once it occurs it requires costly clean up and/or restoration.

The best strategy is a combination of various methods: (a) improving the capacity of local governments to manage nonpoint source pollution combined with (b) educating the population to follow best prevention, restoration, and pollution control practices, as well as BMP's (Best Management Practices) in domestic, commercial, recreational and industrial activities.

An area-wide watershed management plan should be developed and implemented to avoid high costs and efforts needed for future cleanup and restoration. The watershed management plan will be a valuable tool in the hands of local government and other regulation agencies. It will prescribe pollution control measures considering various potentially pollution creating activities and development. These would include, but may not be limited to, storm drainage retainage and treatment prior to disbursement into stream and lakes. Education and information provided to citizens can also prevent various incidents of polluting.

While the storm water quality testing has not been included in this (first) part of the study, potential concerns are listed for each watershed in the "Watershed" section, which describes various watersheds.

A table classifying potential pollutants has also been included in Appendix 6.

## **RECOMMENDATIONS FOR FOLLOW UP WORK AND STUDIES**

Based on the initial assessment work conducted by BCE Inc. the following list of recommended studies and work items was developed to improve the quality of the existing storm water runoff and non-point source pollution incidents in Cordova.

### **Additional Studies Needed**

- 1) Do limited water quality testing at storm drain outfalls, including Odiak Pond, Eyak Lake and others for example. During the site visit to the Odiak Pond outfall area (behind the hospital) potential signs of water quality issues and wetland impairment was noted. A site assessment and testing should be conducted to check the extent of the impacted area and test the runoff quality. This work could be broken into phases as well:
  - a. *Confirm or discount impacts.* Sampling, testing, and data analysis to identify contamination (fecal coliform, hydrocarbons, etc).
  - b. *Delineation and Remediation.* Horizontal and vertical limits of the extent of contamination. Evaluate risks to Odiak pond aquatic and terrestrial environment, and human health. Conduct remediation: Based on the findings remedial actions would be proposed and engineered solution could be designed to remediate any contamination issues.
  - c. Provide additional surveying and site reconnaissance to complete the GIS map developed.

### **Additional Work Needed**

- 1) Develop a watershed management plan and requirements to be implemented.
  - a. Develop a list and prioritize pollution and runoff discharge concerns for each watershed and specific areas.
  - b. A set of BMP's (Best Management Practices) will be suggested for the city's and local citizen organizations use concerning storm water runoff management and treatment, non-point source pollution, aquatic organisms and habitat management. *It is our understanding that the City of Cordova does not currently have requirements or an established set of Best Management Practices (BMP's) for handling storm water and nonpoint source pollution.* Developed BMP's would focus on control, minimization and/or remediation of pollutants observed in various areas within city limits. These would cover:
    - i. Sediment production and erosion control;
    - ii. Control, storage, and removal of hydrocarbons (petroleum products) and chemicals;

- iii. Snow removal practices and designated disposal areas;
  - iv. Gravel pit operations;
    - v. Storage of equipment and vehicles; by the city, industry and residents;
    - vi. Maintenance operations (shop, road, etc) for City and private areas.
  - vii. Identify for the public all storm water drains that drain to fish streams or habitat sensitive areas. Work with CRWP to develop signs and other special features that state: “drains to fish stream”.
- 2) Work with the city planning department, public works, DNR , DEC, and ADF&G to get the general approval for plans and documents developed in item #1 above.
  - 3) Work with all regulatory agencies, involved and interested volunteer groups to safe-guard sockeye and other species spawning and habitat areas around Eyak Lake, Old and New Harbors, Orca Inlet and other water bodies.
  - 4) Identify potential areas of city development and provide acceptable storm water runoff solutions.
  - 5) Design or recommend a set of alternatives to improve safety of pollutants collection and disposal (such as oil disposal) at the harbor and other facilities. This may include, but will not be limited to the following:
    - a. Provide clear signage.
    - b. Isolate trash/dumpsters from oil disposal.
    - c. Provide special collection dumpsters for oil filters and other pollutants and identify drainage requirements.
    - d. Add shelters over pollutant storage (such as used oil storage, etc.) to avoid water collection and drainage issues.
    - e. Recommendations to remove all fluids from abandoned vehicles on city property.
    - f. Develop oil and contaminate spill prevention plan if none exist for city and private residents’ use.



## **BIBLIOGRAPHY**

AMEC Earth & Environmental. (July 2007). *Watershed Planning Using the EPA Draft Handbook*. Ken Hickey, Scott Stoodley, Ph.D.

Dept. of Civil and Environmental Engineering, University of Alabama, Tuscaloosa, AL. (January 2004). *Findings from the National Stormwater Quality Database (NSQD)*. Robert Pitt, Alex Maestre, and Renee Morquecho.

State of Alaska, Department of Environmental Conservation. (2003). *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances*.

Land use and pollutants: causes and effects. Retrieved February 18, 2008, from [http://www.ci.austin.tx.us/watershed/downloads/land\\_use\\_pollute.doc](http://www.ci.austin.tx.us/watershed/downloads/land_use_pollute.doc)

Types of pollutants, sources and effects. Retrieved February 18, 2008, from [http://www.ci.austin.tx.us/watershed/downloads/hydro\\_land\\_use\\_pol.doc](http://www.ci.austin.tx.us/watershed/downloads/hydro_land_use_pol.doc)

1985 Report, Eyak Lake AMSA Corporative Management Plan

NOAA Study, Identification of PAH Discharge into Eyak Lake from Stormwater Drains, Auke bay Laboratory, National Marine Fisheries Services