FACT SHEET FOR NPDES PERMIT NO. WA0040975

WILLAPA BAY/GRAYS HARBOR OYSTER GROWERS ASSOCIATION

and

FARM AND FOREST HELICOPTER SERVICE

March 2006

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INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES), which is administered by the Environmental Protection Agency (EPA). The EPA has authorized the state of Washington to administer the NPDES permit program. Chapter 90.48 RCW defines the Department of Ecology's (Department) authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the state include procedures for issuing permits (Chapter 173-220 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least 30 days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

The fact sheet and draft permit will be reviewed by the Permittee. Errors and omissions identified will be corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicants	1. Willapa Bay/Grays Harbor Oyster Growers Association and 2. Farm and Forest Helicopter Service Inc.
Facility Name and Address	1. P.O. Box 3, Ocean Park WA 98540 2. P.O. Box 404, Napavine, WA 98565
Type of Facility	1. Association of Oyster Growers and 2. Agricultural Sprayers
SIC Code	1. 0913 and 2. 0721
Discharge Location	Waterbody name: Willapa Bay and Grays Harbor Latitude: 46° 24' N to 47° 00' N Longitude: 123° 51' W to 124° 02' W
Water Body ID Number	Willapa Bay 11-24-01 Grays Harbor 10-22-03

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

HISTORY

General History

Oysters have been farmed in Willapa Bay since about 1849.

Of the 45,000 acres of tidelands in Willapa Bay and 34,460 in Grays Harbor, approximately 9,000 acres (20 percent) in Willapa and 900 acres (3 percent) in Grays Harbor are farmed for oysters or clams.

Since the 1940's, Willapa Bay and Grays Harbor have experienced expansive growth in populations of burrowing ghost (Neotrypaea californiensis) and mud shrimp (Upogebia pugettensis). In Willapa Bay it is estimated that 15,000 to 20,000 acres are dominated by burrowing shrimp (Dumbauld and Tufts, 2000).

Over 3,000 acres of privately-owned oyster growing tidelands are estimated to have been impacted for not only oyster culture but also as habitat for nearly all other estuarine biota (e.g., eel grass, clams, worms, etc.).

History of Carbaryl Control

Due to its relatively low environmental persistence, carbaryl was identified in the early 1960's by public fisheries agencies after years of testing as the safest, most cost-effective, and reliable burrowing shrimp management tool. Over the past decade, the Department has authorized, in accordance with Chapter 90.48 Revised Code of Washington (RCW), the application of carbaryl to oyster beds for the control of burrowing shrimp. The Department issues growers NPDES permits which include water quality modifications as specified in Chapter 173-201A-110 Washington Administrative Code (WAC). The use of carbaryl for burrowing shrimp control currently complies with the provisions of Washington State Local Needs Pesticide Registration No. WA-900013 issued by EPA through the Washington Department of Agriculture under authority of section 24(c) of the Amended Federal Insecticide, Fungicide, and Rodenticide Act. Over 250 studies associated with burrowing shrimp biology and management in Willapa Bay have been conducted. An Environmental Impact Statement was completed in 1985 with over 120 citations related to burrowing shrimp control. A supplemental Environmental Impact Statement was completed in 1992 with an additional 75 citations on studies completed between 1984 and 1989. Since 1990, approximately 75 additional studies have been published or are in completed manuscript form. While many of these studies have focused on the affects of carbaryl in the brackish water environment of Willapa Bay, others have examined a wide range of directly related subjects such as alternative pest management strategies and tactics.

Currently, the conventional plan to manage burrowing shrimp in the Willapa Bay and Grays Harbor is based on carbaryl applications. The use of carbaryl for burrowing shrimp is presently and has always been limited to Willapa Bay and Grays Harbor. On average over the last three years Willapa Bay/Grays Harbor Growers Association has applied carbaryl on 542 acres, but they are allowed a maximum of 800 acres each year.

Industrial Process

Oyster farming takes place on privately-owned or leased intertidal areas of Willapa Bay and Grays Harbor. Oysters are cultivated through the propagation of larval oysters on shore or from natural reproduction which are then grown on natural sand and silt bottoms, existing oyster reefs and/or suspended on ropes or wires. Some oysters are grown from the larval stage in one place while others are shifted from bed to bed at various stages in their lives.

Shellfish production is an important part of the Washington coastal communities' livelihood. Oyster production varies throughout the year, peaking in the winter and reaching an annual low in the summertime. Best management practices employed have been governed over the years by continuous trials controlled by the Washington Departments of Ecology, Fish and Wildlife, and Agriculture. These efforts have identified a minimum application rate and the least dispersive methods of application.

Recent Legal Decisions

On March 12, 2001, the U.S. Court of Appeals for the Ninth Circuit in *Headwaters Inc. v Talent Irrigation District* ruled that water quality modifications for herbicide applications in waters of the United States (irrigation waters) would require a NPDES permit in addition to or in place of a water quality modification. Based on this decision, the Department determined to write NPDES permits for all temporary water quality modifications for the application of pesticides under WAC 173-201A-110.

Post U.S. Ninth Circuit Court of Appeals Ruling: *Headwaters Inc v. Talent Irrigation District*

In September 2005, the U.S. Ninth Circuit Court of Appeals ruled on the case *Fairhurst v. Hagener*. The Court found that the application of a herbicide with no residue and which did not have any unintended consequences was not a waste and therefore did not require an NPDES permit. The Department is issuing a NPDES permit for Willapa Bay Grays Harbor Oyster Growers Association based on the fact that there is an application of carbaryl on tidelands which leaves residues and pollution.

DISCHARGE OUTFALL

There is no discrete outfall for this permit, the discharges occur at shifting area locations once every three to ten years as required. The receiving waters are Willapa Bay and Grays Harbor. Sites are selected upon application for annual operation plan.

PERMIT STATUS

The Department issued an NPDES permit on May 17, 2002, and this permit expired on January 1, 2006. An application for the NPDES permit was submitted to the Department on June 1, 2005, and accepted by the Department on June 5, 2005. The previous permit placed effluent limitations on carbaryl.

WASTEWATER CHARACTERIZATION

The proposed wastewater discharge (tidal flow from site) is brackish seawaters with carbaryl in suspension.

Reports, Reviews and Summaries (Years 2002-2005)

- The following tables summarize the burrowing shrimp control annual reports for years 2002-2005. These tables show the effluent characteristics (carbaryl concentration trend) for the last four years.

- In the past four years, the association has sampled 47 times, excluding duplicates or replicates, and there were eight locations, which exceeded the acute carbaryl concentration limit over the past four years. All the locations, which exceeded the limits, were different. According to the Department's accepted practice, the carbaryl concentration limit should not be exceeded at any location where the chemicals are applied.

Table 1: **Carbaryl Concentration Spatial Trend: Acute Detection Only (Year 2002)**

S. NO	Treatment Date	Sample Date	Station Name	Sample Readings (µg/L)	Location
1	22-Jul	23-Jul	AC00	0.079	Oysterville, Willapa
2	22-Jul	23-Jul	AC1	0.89	Naselle River Willapa
3	22-Jul	23-Jul	DUP	0.65	Naselle River Willapa
4	22-Jul	23-Jul	AC2	0.18	Nahcotta Channel, Willapa
5	22-Jul	23-Jul	AC3	0.06	Bear River Channel, Willapa
6	22-Jul	23-Jul	AC4	0.75	Stackpole Slough, Willapa
7	25-Jul	26-Jul	AC5	**5.14**	Palix River Channel, Willapa
8	26 Jul	27-Jul	AC6	**3.8**	Willapa River, Willapa
9	26 Jul	27-Jul	AC008	**4.81**	Russel Channel, Willapa
10	26 Jul	27-Jul	REP	5.28	Russel Channel, Willapa
11	8-Aug	10-Aug	AC008	1.42	Russel Channel, Willapa
12	8-Aug	10-Aug	AC009	0.39	Pine Island Channel, Willapa
13	9-Aug	10-Aug	AC7	1.63	North River Channel, Willapa
14	9-Aug	10-Aug	DUP	1.66	North River Channel, Willapa
15	9-Aug	10-Aug	AC8	0.82	Cedar River Channel, Willapa
16	24-Jul	27-Jul	ACGH1	0.27	Oyuhut/Cambell Slough, Grays Harbor
17	24-Jul	27-Jul	ACGH2	0.77	Grass Creek Channel, Grays Harbor

Carbaryl was detected in water sampled for acute detection, but levels were above the levels specified in the permit (3 µg/L) at three out of 14 sites.

Table 2: Carbaryl Concentration Spatial Trend: Acute Detection Only (Year 2003)

S. No	Treatment Date	Sample Date	Station Name	Sample Readings (µg/L)	Location
1	1-Jul	2-Jul	GH-01-ac	0.14	Grays Harbor, South Bay
2	1-Jul	2-Jul	DUP	0.11	Grays Harbor, South Bay
3	2-Jul	3-Jul	NSP-01-ac	0.39	Shoalwater Reservation
4	2-Jul	3-Jul	NSP-01-ac	0.42	Duplicate
5	2-Jul	3-Jul	NSP-02 ac	0.24	Cedar River Channel
6	2-Jul	3-Jul	NSP-02 ac	0.25	Duplicate
7	2-Jul	3-Jul	NSP-02 ac	0.25	Duplicate
8	2-Jul	3-Jul	NSP-03 ac	0.49	Toke Point
9	2-Jul	3-Jul	NSP-05-ac	**3.4**	Pine Island Channel
10	2-Jul	3-Jul	NSP-07-ac	0.81	Off Wilson Point, North
11	14-Jul	15-Jul	SP-01-ac	0.14	Shoalwater Reservation
12	14-Jul	15-Jul	NSP-02-ac	0.32	Cedar River Channel
13	14-Jul	15-Jul	DUP	0.25	Cedar River Channel
14	14-Jul	15-Jul	DUP	0.35	Cedar River Channel
15	14-Jul	15-Jul	SP--04-ac	0.13	Russell Channel
16	14-Jul	15-Jul	SP-06-ac	0.31	Bone River at Highway 101
17	14-Jul	15-Jul	SP-07-ac	0.55	Off Wilson Point, North
18	14-Jul	14-Jul	STK-01-ac	ND	Stackpole Slough, North
19	15-Jul	16-Jul	STK-03-ac	0.63	Naslle River Station house
20	15-Jul	16-Jul	DUP	0.17	Naslle River Stationhouse

For 2003, the carbaryl concentration limit was exceeded one time out of 16 stations.

Table 3: Carbaryl Concentration Spatial Trend: Acute Detection Only (Year 2004)

S. No	Treatment Date	Sample Date	Station Name	Sample Readings (µg/L)	Location
1	1-Jul	2-Jul	AC01-GHN	**7**	Grays Harbor -North Bay
2	1-Jul	2-Jul	AC02-OYS	2	Oysterville - Stackpole Slough
3	2-Jul	2-Jul	AC03-NAH	0.3	Nahcotta - Middle Island Sands
4	2-Jul	3-Jul	AC04-NCR	3	N.Cedar R. - E of Toke Pt.
5	2-Jul	3-Jul	AC05-NCR	**8.3**	N.Cedar R - Bay Point
6	2-Jul	3-Jul	AC-06-STP	3	Stony Pt. - E. of Pine Isl. Channel
7	2-Jul	3-Jul	AC-07-STP	0.8	Stony Pt. Russel Channel
8	2-Jul	3-Jul	DUP	0.5	Duplicate
9	6-Jul	7-Jul	AC09-NEM	0.15	Nemah -S. of Station House
10	2-Jul	14-Jul	AC08-STP	3	Grays Harbor - N. Bay Channel

Table 3 shows Carbaryl concentrations exceeded criteria in year 2004, for the stations of AC01-GHN, and AC05-NCR. The amount of carbaryl concentration exceeded the limit of three significantly in both cases, 7 µg/L for Grays Harbor-North Bay and 8.3 µg/L for N. Cedar R – Bay Point. These two readings of carbaryl concentration were the two highest out of all four years of acute detections, which exceeded the carbaryl concentration limit.

Table 4: Carbaryl Concentration Spatial Trend: Acute Detection Only (Year 2005)

S. No	Treatment Date	Sample Date	Station Name	Sample Readings (µg/L)	Location	# of Acres Applied	Percent of total Acres
1	5-Jul	6-Jul	AC01-BCP	**4.6**	Bay Center/Palix-N of Pine Island Channel	99	15.7 percent
2	5-Jul	6-Jul	DUP	5	Duplicate		
3	20-Jul	21-Jul	AC02-NEM	**3.5**	Nemah-at largest beds	72.7	11.5 percent
4	20-Jul	21-Jul	AC03-WIL	0.97	Willapa - at largest beds	100	15.8 percent
5	20-Jul	21-Jul	DUP	0.36	Duplicate		
6	21-Jul	22-Jul	AC-04-STP	0.21	Stony Pt. -E of Pie Isl. Channel	206	32.6 percent
7	21-Jul	22-Jul	DUP	0.21	Duplicate		
8	22-Jul	23-Jul	AC-05-NCR	1.3	North/Cedar River - Bay Pt.	30	4.7 percent
9	22-Jul	23-Jul	AC-06-NGH	1.7	Grays Harbor – North Bay	58.9	9.3 percent
10	22-Jul	23-Jul	AC-06-SGH	0.21	Grays Harbor – South Bay	60.5	9.6 percent
11	20-Jul	21-Jul	DUP	0.18	Duplicate		
12	23-Jul	24-Jul	AC-08 NAH	0.19	Nahcotta- Middle Island	4	.6 percent
13	23-Jul	24-Jul	DUP	0.18	Duplicate		
TOTAL						631	100 percent

Table 4 shows that two out of eight stations (25 percent) exceeded carbaryl concentration criteria. The stations, which had carbaryl concentrations exceeding the limit, represented 27 percent of the total acres treated, which were tested for acute carbaryl limits in 2005. In the two cases which exceeded the limit, one sample reading was 3.5 µg/L which was only 0.5 µg/L above the limit and the other sample from Bay Center/Palix-N of Point Island was 4.6 µg/L and this was 1.6 µg/L above the maximum limit.

Table 5: Number of Acres Sprayed with Carbaryl and the Total Amount of Carbaryl Applied: Years 2003- 2005

Year	# of Acres	Pounds of Carbaryl (aic)	Percent Change in Pounds Applied (aic)	Pounds (aic)/acre
2003	509.7	3994		7.84
2004	542.5	4340	8.66 percent	8.00
2005	576.1	4536	4.51 percent	7.87

SEPA COMPLIANCE

State Environmental Policy Act (SEPA) compliance is not required for a facility that has undergone an EIS. This is the Supplemental EIS dated March 31, 1992. SEPA, however, has been done.

PROPOSED PERMIT LIMITATIONS

Federal and State regulations require that effluent limitations set forth in a NPDES permit must be either technology- or water quality-based. Technology-based limitations are based upon the treatment methods available to treat specific pollutants. Technology-based limitations are set by regulation or developed on a case-by-case basis 40 CFR 125.3 and Chapter 173-220 WAC. Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards Chapter 173-204 WAC or the National Toxic Rule 40 CFR 131.36. The more stringent of these two limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the state of Washington were determined and included in this permit. The Department does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent**.** Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation**.** Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

The state has technology – based requirements for pollutant control described as “all known, available, and reasonable methods of prevention control, and treatment” (AKART). AKART is referenced in state statue under RCW 90.48.010, RCW 90.48.520, RCW 90.52.040, and RCW 90.54.020. Washington State law allows the Department to require permitting and monitoring for any discharge that has the potential to pollute waters of the state (RCW 90.48.080). In order to update AKART for burrowing shrimp controls, an IPM plan is required in the Schedule of Compliance. These efforts should serve to update technology based effluent limits. Practices as set forth in S4. and S7. are currently accepted as AKART for the control of burrowing shrimp in Willapa Bay and Grays Harbor.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a state regulation designed to protect the beneficial uses of the surface waters of the state. Surface water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin wide total maximum daily loading study (TMDL). Surface water quality based limits do not include carbaryl as a pollutant.

NUMERICAL CRITERIA FOR THE PROTECTION OF AQUATIC LIFE

"Numerical" water quality criteria are numerical values set forth in the state of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the Water Quality Standards are used along with chemical and physical data for the wastewater and receiving

water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit. The extant numerical criteria for the protection of aquatic life do not list carbaryl as a pollutant. The Department published a report in 2001, titled "Carbaryl Concentration in Willapa Bay and Recommendations for Water Quality Guidelines." The criteria developed by the Department reflected the recommendations of 2001 carbaryl report. Since there are no water quality standards for carbaryl, the Department followed the provisions of WAC 173-201A and utilized the protocols developed by the U.S. Environmental Protection Agency (EPA). The established criteria are 3.0 µg/L and 0.06 µg/L, for acute and chronic respectively.

NUMERICAL CRITERIA FOR THE PROTECTION OF HUMAN HEALTH

The U.S. EPA has promulgated 91 numeric water quality criteria for the protection of human health that are applicable to Washington State (EPA 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

NARRATIVE CRITERIA

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the state of Washington.

SHORT TERM MODIFICATION

When concentrations of a substance exceed the acute and chronic limits either stated in WAC 173-201A-030 or derived under WAC 173-201A-110, the regulation allows the Department to issue a short-term modification to the water quality standards for the control of burrowing shrimp. Since the average concentrations exceed the Numerical Criteria for the Protection of Aquatic Life by several orders of magnitude, the Department proposes to issue short-term modifications of the criteria. Short term modifications were included in the last permit. The duration of the short term modification for the acute limit is extended from 24 to 48-hours for this permit. The extended duration is proposed based on an inability to reliably meet standards within 24-hours. The 24-hour duration was initially selected as a best estimate of the minimum time for concentrations to drop below acute standards (one full tidal cycle). After several years of adjusting spray schedules and spray areas to minimize the time of exceedence, it is believed that the 24-hour estimate is too restrictive. The period is proposed to be extended to 48-hours to allow an additional full tidal cycle within the duration of the short term modification.

ANTIDEGRADATION

The state of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when the natural conditions of a receiving water are of higher quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070 WAC 173-204-120.

CRITICAL CONDITIONS

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic water body uses. The application condition of the summer/early fall (July 1 through October 31) and low tides define the critical condition.

The Department with the approval from the Washington State Department of Fish and Wildlife, is allowing the application of carbaryl for the months of July 1 to October 31. These months are selected for a vriety of reasons including the following; shrimp activity is highest during the summer and temperatures are optimum for faster breakdown of carbaryl, low tides occur during the day during most of this period allowing application to be made by helicopter during the day light, and new sand shrimp recruit to the beds during the end of this timer period allowing an application of carbaryl to reduce shrimp population significantly.

MIXING ZONES

The Water Quality Standards allow the Department to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both “acute” and “chronic” mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART) and in accordance with other mixing zone requirements of WAC 173-201A-100. AKART studies are required in the Schedule of Compliance.

DESCRIPTION OF THE RECEIVING WATER

The treated areas discharge to Willapa Bay and Grays Harbor that both designate as Class A receiving water. Nearby point source outfalls include the Westport Publicly Owned Treatment Works (POTW) and Ocean Gold Seafood in Westport for Grays Harbor. Willapa Bay has point source inputs from the Willapa River (Raymond and South Bend POTWs and fish processors: Coast Seafoods, Wiegardt Bros., South Bend Packers and East Point Seafoods), and Nelson Crab Inc. in Tokeland. Significant nearby non-point sources of pollutants include cranberry bogs in Grayland, where cabaryl has been found in samples collected in connection with a study of pesticide contamination in these bogs. Characteristic uses for class A include the following:

> water supply (domestic, industrial, agricultural); stock watering; fish migration; fish and shellfish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

SURFACE WATER QUALITY CRITERIA

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U. S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992)Criteria for this discharge are summarized below:

Fecal Coliforms	100 organisms/100 mL maximum geometric mean
Dissolved Oxygen	8 mg/L minimum
Temperature	18 degrees Celsius maximum or incremental increases above background
pH	6.5 to 8.5 standard units
Turbidity	Less than 5 NTU above background

CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

The Permittee is required in section S2. of the proposed permit to collect background concentrations and consequent samples for verification.

HUMAN HEALTH

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

SEDIMENT QUALITY

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400).

GROUND WATER QUALITY LIMITATIONS

The Department has promulgated Ground Water Quality Standards (Chapter 173-200 WAC) to protect beneficial uses of ground water. Permits issued by the Department shall be conditioned in such a manner so as not to allow violations of those standards (WAC 173-200-100).

This Permittee has no discharge to ground and therefore no limitations are required based on potential effects to ground water.

COMPARISON OF EFFLUENT LIMITS WITH THE EXISTING PERMIT ISSUED AND NEW PROPOSED PERMIT

The effluent limits for this permit has not changed from the NPDES permit which expired on January 1, 2006.

Parameter	**Existing Limits**	**Proposed Limits**
Carbaryl (Acute Limit)	3.0 µg/L (24-hours after application)	3.0 µg/L (48-hours after application)
Carbaryl (Chronic Limits, 30 Days after Application)	0.06 µg/L	0.06 µg/L

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

Monitoring for carbaryl is being required to determine if this substance is in any way persistent in the environment. The monitoring schedule is detailed in the proposed permit under Condition S2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

LAB ACCREDITATION

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories*

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-220-210).

SPILL PLAN

The Department has determined that the Permittee stores a quantity of chemicals that have the potential to cause water pollution if accidentally released. The Department has the authority to require the Permittee to develop best management plans to prevent this accidental release under RCW 90.48.080.

The proposed permit requires the Permittee to develop and implement a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs.

SCHEDULE OF COMPLIANCE

It is the intent of the Schedule of Compliance to support efforts to establish alternatives to pesticide application for AKART for burrowing shrimp control. To date, the Washington Departments of Ecology, Agriculture, Fish and Wildlife and the Washington State Commission on Pesticide Registration, singly

and in combination, have required, sponsored, funded, and approved the studies mentioned in this document and the permit application. The oyster growers have cooperated in these studies.

The Willapa Bay/Grays Harbor Growers Association (WGHOGA) has strived to develop an Integrated Pest Management Plan (IPM) for a burrowing shrimp on commercial grounds for over 15 years. In 1992, a burrowing shrimp committee comprised of both association members and representative from several agencies and other interested groups, produced a document that included IPM as a favorable alternative. The IPM plan submitted in March 2003 identified additional steps to be taken for the development, evaluation and implementation of IPM tactics. In the last three years, the WGHOGA has assembled a research team with expert in agricultural engineering, mechanical engineering, mud flat ecology, biological control, shellfish culture and IPM development. Recently, the Washington State Legislature appropriated $200, 000 per year for at least two years specifically for the development of alternative management tactics.
The sediment impact zone study was completed in January 2006 to determine the spatial extent, duration and severity of impacts to the benthic community. Preliminary analysis of the results of this study indicate that benthic impacts do not extend much beyond the carbaryl application site boundaries; that the carbaryl impacts are not severe, in that entire classes/families of organisms do not disappear; abundance and metrics such as diversity and richness do not fall precipitously; and that observed impacts are not long-term, likely not lasting as long as a year.

GENERAL CONDITIONS.

General Conditions are based directly on state laws and regulations and have been standardized for all individual industrial NPDES permits issued by the Department.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary to meet Water Quality Standards for Surface Waters, Sediment Quality Standards, or Water Quality Standards for Ground Waters, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies. The Department may also modify this permit as a result of new or amended state or federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, protect human health, aquatic life, and the beneficial uses of waters of the state of Washington. The permit will expire on June 30, 2011.

REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA).

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. Water Quality Standards Handbook. USEPA Office of Water, Washington, D.C.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

1994. Permit Writer's Manual. Publication Number 92-109

Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public notice of application was published on June 22, 2005 and June 29, 2005 in the *Chinook Observer* to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department will publish a Public Notice of Draft (PNOD) on May 3, 2006 in the *Willapa Harbor Herald* to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Industrial Unit Permit Coordinator
Department of Ecology
Southwest Regional Office
P.O.Box 47775
Olympia, WA 98004-7775

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the 30 day comment period to the address above. The request for a hearing shall indicate the interest of the party and reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-216-100). Public notice regarding any hearing will be circulated at least 30 days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing.

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within 30 days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, (360) 407-6290, or by writing to the address listed above.

This permit was written by Aziz Mahar, P.E.

APPENDIX B--GLOSSARY

Acute Toxicity--The lethal effect of a compound on an organism that occurs in a short period of time, usually 48 to 96 hours.

AKART-- An acronym for "all known, available, and reasonable methods of treatment."

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation --The average of the measured values obtained over a calendar month's time.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots.

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction e.g., a dilution factor of 10 means the effluent comprises 10 percent by volume and the receiving water 90 percent.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Major Facility--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in state regulations (Chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the Federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7.0 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Responsible Corporate Officer-- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Upset--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit--A limit on the concentration of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

APPENDIX C--TECHNICAL CALCULATIONS

CONCENTRATION OF CARBARYL AT EDGE OF REGULATORY MIXING ZONE

Reference:

Johnson Art, March 2001. Carbaryl Concentrations in Willapa Bay and Recommendations for Water Quality Guidelines. Ecology Publication No. 01-03-005.

From: Washington Department of Fisheries and Washington Department of Ecology , Olympia, Washington March 31, 1992. Supplemental Environmental Impact Statement, Use of the Insecticide Carbaryl to Control Ghost and Mud Shrimp in Oyster Beds of Willapa Bay and Grays Harbor. Pg. 26

Referencing:

Tufts, D. F. (ed.). 1990. Control of Burrowing Shrimp in Willapa Bay and Grays Harbor in 1987, Washington Department of Fisheries, Special Shellfish Report No. 5. Draft Report.

APPENDIX D--RESPONSE TO COMMENTS

Comments received via e-mail on May 4, 2006 from Fred LaPointe of Westport, Washington.

Comment 1

I am absolutely against issuing a permit to apply Carbaryl to any of the waters of Washington State. Oysters have been harvested for hundreds of years without the use of poisons. The use of carbaryl has been outlawed for years and I see no reason why anyone should be issued a permit for its use. Some of these carbaryl using hypocrits are demanding that the developers of the Links at Half Moon Bay use only organic fertilizers on the golf course yet they want to spray poison in our waters. NO PERMITS FOR CARBARYL!

Ecology Response 1:

Carbaryl use is not outlawed in the United States. It is a registered pesticide approved for the application covered by this permit.

Comments received via e-mail June 3, 2006 from Fritzi Cohen.

Comment 2

The main reason that I made the concession to actually agreeing to the settlement was that there was a buffer between my beds of 1000 ft. I see no mention of it in the permit and would like to know if our settlement is incorporated into some other document for this NPDES. I would like to know asap because I may have to hire an attorney to intervene in this. PS. Also at what point is the actual amount (gallons) of carbaryl agreed to?

Ecology Response 2

This Ecology permit is separate from the Agreement between the WGHOGA and the Washington Toxics Coalition. That is why Ecology did not incorporate the agreement in the permit and fact sheet. The Department does not limit the gallons of carbaryl used, but limits the acreage (200 in Grays Harbor and 600 in Willapa Bay) that can receive a carbaryl application. There is a maximum limit of 8 pounds of active ingredient of carbaryl allowed per acre.

Comments received via e-mail May 29, 2006 from Larry Warnberg of Nahcotta Oyster Farm.

Comment 3

1. Under "General History" it is stated that "Oysters have been farmed in Willapa Bay since about 1849." My reading of the history is that oyster farming began in the mid-1890s with the rail trans-shipment of Chesapeake oyster seed, following the over-harvesting of wild native Olympia oysters (a fishery, not farming).

The Fact Sheet should note that the majority of oysters currently farmed in Willapa Bay and Grays Harbor are not native speices, while the burrowing shrimp are indigenous.

2. "Since the 1940s, Willapa Bay and Grays Harbor have experienced expansive growth in populations of

burrowing ghost and mud shrimp. In Willapa Bay it is estimated that 15,000 to 20,000 acres are dominated by burrowing shrimp (Dumbauld and Tufts, 2000)."

This overly simplistic statement about the increase of shrimp populations fails to address concurrent ecosystem changes such as increased sedimentation of the estuaries from poor logging practices that increased habitat for burrowing shrimp. Dozens of non-native species, including Asian oysters, have been introduced intentionally or accidentally. Mechanical harvesting of oysters through dredging removes vegetation and shell substrate, leaving soft substrate habitat behind that is highly suitable for shrimp. Why is there no reference to increased habitat for shrimp? During the past four years there has been minimal recruitment of juvenile shrimp into west coast estuaries. During the past two summers the Growers did not fill their quota of acreage that could be sprayed because not enough shrimpy ground could be found. Rather than increasing, the population of shrimp seems to be decreasing, with potentially serious negative consequences for the estuary ecosystems, since shrimp are a biologically significant foundation species. Why is there no reference to this more recent research?

Ecology Response 3

The fact sheet is intended to provide a description of the situation, and is not intended to provide an exhaustive coverage of all studies conducted.

Comment 4

3. "Due to its relatively low environmental persistence…"
This statement is inaccurate, and should be deleted. Carbaryl is known to persist in sediments 6 months or longer, indiscriminately killing a wide range of invertebrates. Benthic organisms may be repelled from poisoned ground for several years. The facts do not support the claim of "low environmental persistence."

Ecology Response 4

Scientific studies have not shown carbaryl to be significantly persistent in water or sediment. The usage of the expression "low environmental persistence" means the pesticide will degrade within one year of application. Under some conditions carbaryl does persist for as long as 60 days, but not as long as one year.

Comment 5

"Recent Legal Decisions" correctly identifies the need for an NPDES permit for carbaryl, since aquatic use of this pesticide "leaves residues and pollution." But there is no reference to the 2003 Settlement Agreement which mandates the phase-out and end of carbaryl use in 2012. Why is there no reference to the Settlement Agreement in the Fact Sheet?

Ecology Response 5

This Ecology permit is separate from the Agreement between the WGHOGA and the Washington Toxics Coalition. That is why Ecology did not incorporate the details of agreement in the fact sheet.

Comment 6

Under "Reports, Reviews and Summaries" it is stated that; "According to the Department's accepted

practice, the carbaryl concentration limit should not be exceeded at any location where the chemicals are applied." Yet the permit limits for both acute and chronic levels were exceeded repeatedly during the previous permit period. What did Ecology do? How did Ecology respond to these permit exceedances? Where are the Facts?

Ecology Response 6

During the course of the first permit issued May 2002, the Willapa Bay Grays Harbor Oyster Growers Association (WBGHOA) exceeded the acute level limits 8 out of 47 locations (17 percent). The Department considered the WBGHOA to be making good faith efforts to improve the spray program to minimize exceedances during this time.

Comment 7

Under "Technology-Based Effluent Limitations" it is stated that; "…an IPM plan is required in the Schedule of Compliance." An IPM plan has been required since the SEIS for burrowing shrimp control was completed in 1992. After repeated efforts to state agencies, and repeated legal efforts by citizen groups, the Growers still have not completed an IPM plan. Apparently, 14 years is not enough to complete the required IPM plan. Ecology proposes to extend the compliance schedule another year, and possibly beyond. How does Ecology justify another extension for compliance? Where are the Facts about the sad history of non-compliance by the Growers who spray?

Ecology Response 7

The WBGHOA has submitted to Ecology studies that are part of their IPM plan. The WBGHOA is required to submit the updated IPM plan to Ecology by February 2007. Ecology is not giving an extension on the IPM plan, but this updated IPM plan is part of a new permit condition.

Comment 8

Under "Surface Water Quality-Based Effluent Limitations" it is stated that; "Surface water quality based limits do not include carbaryl as a pollutant." How can this be? The Fact Sheet acknowledges the legal decision requiring an NPDES permit for carbaryl because it "leaves residues and pollution." How can aquatic use of carbaryl be recognized as a pollutant under the Clean Water Act and supportive legal decisions, yet be excluded as a pollutant under State Surface Water Quality Standards? Does not the more stringent definition apply?

Ecology Response 8

Carbaryl is a pollutant. The statement was intended to indicate that there is not a numerical criteria established specifically for carbaryl by WAC 173-201A. The Department followed the procedures identified in WAC 173-201A to establish numeric criteria for carbaryl.

Comment 9

The section on Short Term Modification makes it clear that Ecology abandoned any intention to enforce permit limits for carbaryl discharges. "Since the average concentrations (from past spraying) exceed the Numerical Criteria for the Protection of Aquatic Life by several orders of magnitude, the Department proposes to issue short-term-modifications of the criteria. The duration of the short term modification for the acute limit is extended from 24 to 48-hours for this permit. The extended duration is proposed based on an inability to reliably meet standards within 24-hours." Is dilution the solution to this blatant pollution? Is Ecology powerless to enforce reasonable limits for the protection of aquatic life?

Ecology Response 9

The duration of the short term modification for the acute limit is extended from 24 to 48-hours for this permit. The extended duration proposed is based on an inability to reliably meet standards with 24-hours. The 24-hour duration was initially selected as a best estimate of the minimum time for concentrations to drop below acute standards (one full tidal cycle). After several years of adjusting spray schedules and spray areas to minimize exceedences new information has been gathered which was not available at the time 24-hours was selected. This information suggests that the 24-hour estimate is too restrictive. Therefore, the 24-hour short term modification is extended to 48-hours to allow an additional full tidal cycle within the duration of the short term modification.

Comment 10

Under "Critical Conditions" the time period for spraying has been doubled from two months to four. It is stated that; "…shrimp activity is highest during the summer and temperatures are optimum for faster breakdown of carbaryl." Since the warmest water temperatures occur in July and August, when spraying has occurred in the past, why add Sept. and Oct. to the spray interval when water temperatures drop and there will likely be longer persistence of carbaryl? Why is the spray interval doubled when the Growers continue to be in non-compliance with the long-standing requirement to complete an IPM plan?

Ecology Response 10

Washington State Department of Fish and Wildlife (WDFW) states that spraying outside July/August could help to control shirmp recruited to the beds in September and October. One problem with the July/August spray is that it misses the new recruits so while the adults have been killed, there is another year class ready to become active the following spring. If adults and recruits are treated at the same time, a year is gained in not having to treat the substrate. If spraying is delayed until September/October, better results maybe achieved with the same application of carbaryl.

Comment 11

Under "Mixing Zones" it is stated that; "Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART). AKART studies are required in the Schedule of Compliance." Does this mean that no mixing zones are included, since AKART has not been completed due to the lack of an IPM plan? Will mixing zones be added to the permit if the IPM plan and AKART are eventually completed?

Ecology Response 11

No mixing zone is included in the current permit. AKART is not a static determination but one which is

intended to achieve better results over time. Management practices set forth in the permit are currently accepted as AKART.

Comment 12

"It is the intent of the Schedule of Compliance to support efforts to establish alternatives to pesticide application for AKART for burrowing shrimp control. To date, the Washington Departments of Ecology, Agriculture, Fish and Wildlife and the Washington State Commission on Pesticide Registration, singly and in combination, have required, sponsored, funded and approved the studies mentioned in this document and the permit application. The oyster growers have cooperated in these studies." The State has bent over backwards spending much money and applying much effort to encourage reduction in the use of carbaryl. But the Growers have not been entirely cooperative. Completion of the required IPM plan has been delayed repeatedly for 16 years. This proposed permit extends the compliance schedule at least another year, maybe longer. Why doesn't Ecology make further spraying of carbaryl contingent on completion of the IPM plan BEFORE issuing another permit to pollute?

Ecology Response 12

An IPM plan was submitted in 2003 that identified additional steps to be taken for implementation of IPM tactics. The permit requires an updated plan to be submitted in 2007.

Comment 13

"The permit will expire on June 30, 2011." Since carbaryl spraying will end after the 2012 season under the previously described Settlement Agreement, will the Growers be required to obtain a permit for the final year of spraying in 2012?

Ecology Response 13

Yes.

Comment 14

On Page 8 of the Permit under Annual Operations Plan Requirements it is stated that; the Plan shall consist of "the treatment schedule showing the days, times, number of acres oyster bed designations, and burrow counts for each oyster bed; no oyster bed may be treated with carbaryl unless the mean burrow count exceeds ten burrows per square meter." It is well-known that counting holes has little correlation to the true number of shrimp in an area, yet this inaccurate method continues to be used to define where carbaryl may be sprayed. Why doesn't Ecology require a more accurate valid measure of shrimp density?

Ecology Response 14

The Department believes that burrow density provides an adequate means to avoid spraying low density shrimp areas.

Comment 15

Under "Schedules of Compliance" it is stated that; "On or before February 1, 2007, the Permittee's (sp.) shall submit to the Department an IPM plan to control burrowing shrimp populations." The Growers have failed to comply with this requirement for 16 years. Why does Ecology believe an IPM plan will be

completed after another one-year delay? I suggest Ecology withhold the proposed permit UNTIL the IPM plan is completed satisfactorily.

Ecology Response 15

See previous responses (Comment 6 & 11).

Comment 16

Under "Compliance With Other Laws and Statutes" it is stated that; "Nothing in this permit shall be construed as excusing the Permittee's (sp.) from compliance with any applicable federal, state, or local statutes, ordinances, or regulations." Extending the deadline for compliance with the long-standing requirement for an IPM plan appears to excuse the Permittee's from reasonable legal requirements. Why doesn't Ecology make the proposed permit contingent on completion of the required IPM plan?

Ecology Response 16

See previous responses (Comment 6 & 11).

Comment 17

Under "Payment of Fees" it is stated that "The Permittee's (sp.) shall submit payment of fees associated with this permit as assessed by the Department." The Department assessed a fee of $45,000 initially for the previous carbaryl permit, but the actual fee levied was only $300. What will be the assessed fee for the proposed permit? Will the fee be reduced, or waived again?

Ecology Response 17

The reduced fee was mandated by the Washington State Legislature. According to WAC 173-224, the fee levied for this permit will be $327.00.

Comment 18

Section G13 and G15 are duplicates: "Penalties For Violating Permit Conditions." Since there were numerous exceedances of the previous permit limits, and no enforcement or penalties, perhaps this section can be deleted. It gives the false impression that Ecology intends to enforce this permit to pollute.

Ecology Response 18

G15was a duplicate of G13, and was deleted.

Comments received May 29, 2006 from John McCabe.

Comment 19

Please note that up until the 1890s, no oysters were farmed in the Willapa Bay. By 1900, exploitation of natural stocks of the native Olympia oyster (Ostrea conchaphila) had rendered this species no longer commercially viable. A former practice of transporting logs by rivers (so called "splash logging") and soil erosion from clear cutting lead to extensive silting in the Willapa Bay. Starting in the 1890s, large quantities of young Eastern oyster (Crassostrea virginica) were imported from the East Coast by rail.

This rather simple form of oyster farming (called "bedding") was successfully practiced by oystermen in the Northeast since the 1830s. California oystermen had started bedding Eastern oysters with mixed success in 1869. However, bedding these oysters in Willapa Bay presented the oystermen with many problems, as the soft soils often proved unsuitable for ground cultivation of the Eastern oyster. The oysters would frequently sink into the soft substrate and suffocate. Willapa Bay oystermen worked hard and made the best of it up until 1919, when an unexplained phenomenon (possibly a virus, bacteria, or other) killed almost all the Eastern Oysters. By the early 20s, the Eastern Oyster had proven itself far more trouble than it was worth. The introduction of the Pacific oyster (Crassostrea gigas; formerly called the Japanese oyster) into Willapa Bay in the late 1920s was successful due to the fact that this oyster species is somewhat more suited for soft substrates. Its shells (or "valves") are different than those of the Eastern oyster. Although many individuals also sink and die, many survive, as this species grows rapidly and, given a chance, is a formidable reef builder. Unlike the Eastern oyster, the Pacific oyster reproduces most successfully in the Willapa Bay (as well as in Hood Canal and elsewhere in our state). Since the late 1920s, the Pacific oyster has been a most welcome guest in the Willapa Bay. However, soft soils, mud and silt in the Willapa Bay have been a challenge for its oystermen since oyster farming began in the 1890s. Farming oysters right on the mud flats ("bottom cultivation") in the Willapa Bay (and Grays Harbor) always was, still is, and likely always will be difficult. I have observed one Willapa Bay oysterman, surrounded by burrowing shrimp, who has been growing copious amounts of delicious Pacific oysters for decades by shifting to off-bottom cultivation (in his case a form of "pole cultivation").

Incidentally, since day one, not only mud and silt have been natural obstacles for oyster farmers choosing to grow oysters directly on tide-flats. Naturally, our native burrowing shrimp species were also always a greater or lesser obstacle in growing oysters with the bottom cultivation method. Historical book reference on burrowing shrimp (Between Pacific Tides; Edward F. Ricketts and Jack Calvin, 1938, revised 1949, Page 228): "Both Callianassa and Upogebia are in ill repute with oyster men…."

If find the term "dominated" a poor choice. If anything, 15,000 to 20,000 acres may be **inhabited** by native burrowing shrimp. Likewise one could ask how many acres are "dominated" by non-native Pacific oysters? I found similarly subjective language in the agenda for the "Washington State University Burrowing Shrimp Workshop" held Feb. 01, 2006: "Walk behind WDFW office to touch/feel/sink in shrimp-infested ground." Anticipating the worst I heeded this warning and invested in a new set of hip waders. Not only did none of us in attendance "sink in shrimp-infested ground," the ground proved to be firm enough for a pair of common deck shoes. The mud shrimp also proved few and far in-between. Had it not been for the assurances by a few outspoken oyster growers in attendance (carbaryl users) that this was not representative of "the problem," anyone in attendance would have had to surmise that there is no "shrimp problem."

Two pictures showing soil conditions behind the WDFW office. They were taken during the course of the above mentioned workshop by this writer and available for viewing online:

http://www.oysters.us/burrowing-shrimp-01.jpg
http://www.oysters.us/burrowing-shrimp-02.jpg

After checking a number of reference books on burrowing shrimp, I conclude this text to be inaccurate. Examples:

Referring to the burrowing shrimp *Neotrypaea (formerly Callianassa) californiensis* type, a quote from the "Encyclopedia of Marine Invertebrates" (1982 T.F.H. Publications Inc.; Page 635):

"*These burrows also provide shelter for other animals; up to ten different species have been found living as commensals with this mud shrimp.*"

Referring to the burrowing shrimp *Neotrypaea (formerly Callianassa) californiensis* type, a quote from "The Sound and the Sea" (Charles J. Flora and Eugene Fairbanks, MD; Page 186):

"*Food consists of detritus, including bacteria, extracted from the mud in which the animal burrows. Within the burrow, other commensal animals may be found: annelid worms, pea crabs, and blind gobies.*"

Similarly on page 189 of the same book regarding the other burrowing shrimp mentioned in this draft (*Upogebia pugettensis*):

> *"The burrows are a haven for many commensal organisms."*

I find it notable that detritus, including bacteria, help keep these commercially unwanted indigenous shrimp alive. What does this mean? I believe it means that the amount of detritus present in the Willapa Bay helps dictate the population level of "mud shrimp." Could this suggest a natural form of "plumbing" or a "cesspool" of sorts? A number of European scientists suspect that the mass mortality of the Portuguese oyster (Crassostrea angulata) in the late 1960s and early 70s may have been directly attributable to over-cultivation and inadequate natural waste processing, giving rise to a virus which wiped out this oyster species and caused the collapse of the entire European oyster industry for several years. These same scientists suggest that this phenomenon may possibly repeat itself in European waters with unchecked cultivation levels of the subsequently introduced Pacific oyster.

I've learned that the mud shrimp species and the commensal native animals they promote do not compete nutritionally with the non-native Pacific oysters (or any oyster species for that matter), as their respective diets are different. I've learned that our various native burrowing shrimp species have been part of the marine ecology of the Pacific Northwest since primordial times, from Alaska to California. I respectfully beg for utmost caution in the legal sanctioning of their wholesale killing for commercial interests.

Please allow me to quote a man by the name of William K. Brooks, likely the foremost American oyster authority of the 19th century, who in 1891 wrote an important book with the simple title "The Oyster":

"[…]*Unfortunately this is now so clear that it can no longer be hidden from sight nor explained away, and everyone knows that, proud as our citizens once were in our birthright in our oyster-beds, we will be unable to give to our children any remnant of our patrimony unless the whole oyster industry is reformed without delay. We have wasted our inheritance by improvidence and mismanagement and blind confidence…*"

His pleadings were aimed primarily at the exploiting Chesapeake Bay oyster industry. His pleadings were ignored. The ultimate horrors of oyster diseases like MSX and Dermo ravage the East Coast industry to this very day. The Willapa Bay is now the largest bay in the contiguous United States which has managed to survive as ecologically sound. The Willapa Bay is not only a treasure for every Washingtonian, it is a national treasure! The Willapa Bay might justly be considered our "little Chesapeake Bay of the West Coast."

I respectfully suggest that you strive to present an ecologically balanced position and throttle the commercially biased position, as this draft comes across to me as purely "selling the need for carbaryl use." At least please include (as quoted from your Dept. of Ecology publication # 01-03-005 found online at http://www.ecy.wa.gov/pubs/0103005.pdf):

"Willapa Bay and Grays Harbor are the only U.S. marine waters where the use of carbaryl or other insecticides is permitted. Because of the scope of applications, direct toxicity to non-target organisms including Dungeness crab, uncertainty about indirect effects on species such as salmon, and perceived human health concerns, this has been a controversial issue."

It believe it should be noted that most of the "shifting from bed to bed" is accomplished by the use of dredges - as is much of the ultimate harvesting. Anyone can easily imagine what dredging does to the consistency of soft marine substrate. The turbid cloud of muddy roiled sediment in the wake of a lumbering dredge must settle somewhere and likely serves well to enhance the preferred habitat of mud shrimp species.

Ecology Response 19

Comments noted.

Comment 20

A most important legal decision pertaining to the gradual phase out of carbaryl use by 2012 in Willapa Bay has been omitted. Why?

Ecology Response 20

This Ecology permit is separate from the Agreement between the WGHOGA and the Washington Toxics Coalition. That is why Ecology did not incorporate the agreement in the fact sheet.

Comment 21

In the Northern hemisphere, summer is defined by convention in meteorology as the whole months of June, July, and August. If shrimp activity is the highest in the summer months and temperatures are optimum during this time for fast breakdown of this pesticide, why should the spraying last until the end of October, months after summer has ended? Fall starts sometime in September. September is also the beginning of the traditional "r-months." Although oysters are edible all year, for many centuries, both in Europe and North America, the "r-months" have been considered by most oyster lovers as the optimal months for the consumption of oysters, particularly if they are to be consumed uncooked (raw). Consumption of oysters in the United States is particularly high during Thanksgiving, Christmas, and New Year. I'd like to point out that only a few weeks after October 31st, the Thanksgiving celebrations begin (as in "oyster stuffing").

Ecology Response 21

See previous response to comment #9.

Comment 22

After attending the mentioned burrowing shrimp workshop, I believe that this preliminary analysis lacks merit as a foundation to base decisions on. I clearly recall Mr. Dumbauld advising the audience that much is still not known about the burrowing shrimp. If I recall correctly, not even the average life expectancy of a mud shrimp is known. If that many questions remain on an animal type which has been

studied as closely as the respective mud shrimp species, one might suspect that the scope of the potential benthic impact is understood even less.

Ecology Response 22

Comments noted.

Comment 23

Although I know the Chinook Observer to be a fine local publication, I question the scope of its ability "to inform the public." I suggest that the vast majority of the oyster consuming public in our state is unaware of any such public notices, much like I was up to about a year ago. I believe that the Dept. of Ecology and consumers would benefit from public notices in publications reaching a broader audience. I further believe that the vast majority of the oyster consuming public, both in our state as well as nationally, is unaware, much like I was up to about a year ago, that Willapa Bay and Grays Harbor are the only oyster beds in our nation which are permitted to be treated with a pesticide. I believe that the American consuming public is well aware of pesticide use on land, however, unaware of pesticide use in marine aquaculture (mariculture).

Ecology Response 23

Generally, public notices are placed in local newspapers where the water quality impacts of the permit will be felt the most.

Comments received via e-mail June 2, 2006, from Steve Booth of the Willapa Bay Grays Harbor Oyster Growers Association.

Comment 24

The effluent limitations for acute and chronic impact were derived in the previous NPDES permit based primarily on water quality based criteria developed by USEPA, but no direct citation was provided. Recent research indicates that live salmonids can tolerate, and that the benthic infauna is not adversely impacted, by carbaryl concentrations higher than 3.0 ppb.

Ecology Response 24

Please see page 19 of the fact sheet (Johnson Art, March 2001. Carbaryl Concentrations in Willapa Bay and Recommendations for Water Quality Guidelines. Ecology Publication NO. 01-03-005.)

Comment 25

Requirements for "Off-Site Downwind" samples for "Airborne depositions" were apparently established in keeping with the Maintenance Requirements for authorization of the Sediment Impact Zone (SIZ) under Sediment Management Standards (WAC 173-204-415(5)). Because results of the recently completed "Study of the SIZ related to the carbaryl-based management program for burrowing shrimp" ("SIZ Study") showed that carbaryl concentrations in the sediment within an area of direct carbaryl application declined to level below 0.33 ppb within 1 year and that impact to the benthic infauna was also seasonally transient, then, by deduction, the impact to the sediment outside the buffer zone, where carbaryl contamination is likely nil or near nil, will also be nil. Thus, the sample is qualitatively meaningless, the regulatory requirement for SIZ authorization is already met by the monitoring schedule presented in the permit.

Ecology Response 25

Monitoring is necessary in order to verify that carbaryl is not applied beyond the buffer zone, potentially affecting areas outside the SIZ.

Comment 26

The WGHOGA has invested heavily and deeply involved in the future development of an IPM Plan for burrowing shrimp. An initial IPM plan was submitted to WDOE in March 2003 in compliance with the previous permit. While submission of an ancillary plan next February is not overly burdensome, the WGHOGA would prefer more active participation by DOE towards IPM development. This would include a more rational approach towards the management of the carbaryl based management plan, including the monitoring schedule.

Ecology Response 26

The requirement for an IPM plan in February 2007 is to provide the Department of Ecology with an updated IPM plan which incorporates current and future activities on burrowing shrimp control.

Comment 27

In compliance with the WACs cited here, as well as the previous permit, the WGHOGA, in consultation with DOE, conducted a study of the SIZ related to the carbaryl based management plan for burrowing shrimp. The resulting report, cited here, was accepted by DOE as meeting those requirements. This ancillary requirement is superfluous. However, in association of with the developing IPM program, the WGHOGA and others are developing more detailed maps of Willapa Bay, including its substrates, which apply to this requirement.

Ecology Response 27

Comments noted.

Comment 28

HISTORY

More General History

Two indigenous species of burrowing shrimp severely impact both the mudflat community and oyster production in Willapa Bay and Grays Harbor, WA and Tillamook Bay, OR. Both ghost WGHOGA Comments to NPDES Permit WA0040975 – p 2

(Neotrypaea californiensis) and mud shrimp (Upogebia pugettensis) reside in burrows beneath the mudflat surface, where they abrogate habitat from other benthic organisms, compete for plankton resources with other estuarine fauna, and severely disrupt the structure of the mudflat substrate by bioturbation (Dumbauld 1994). High densities of burrowing shrimp cause surface dwelling organisms to literally sink in the mud (Peterson 1977, Brenchley 1981, Bird 1982, Posey et al. 1991, Dumbauld et al. 1997, Tamaki 1994). Although indigenous, both species, but particularly ghost shrimp, have greatly increased in density and distribution in the last 60 years, likely due to a combination of factors including loss of seasonal freshwater influx since the damning of the Columbia River (Alan Trimble, University of Washington, personal communication) and a decrease in key predators, particularly sturgeon and perhaps

sardines, due to over-fishing and a reduction in stock recruitment. The detrimental effects of high burrowing shrimp densities to the rest of the estuarine community have also been demonstrated by the return of higher levels of diversity and key indicator species once burrowing shrimp are suppressed (Doty et al.1990; Brooks 1995).

History of Integrated Pest Management

The WGHOGA has diligently strived to develop and develop and implement an IPM plan for burrowing shrimp on commercial shellfish grounds for over 15 years. I n 1992, a Burrowing Shrimp Committee comprised of both Association members and representatives from several agencies and other interested groups, produced a document that included IPM as a favorable alternative. The environmental consulting firm Batelle Laboratories, working in collaboration with the BSC, also described an IPM alternative in 1997, following a two year assessment. In January 2001, following extensive public debate on the use of carbaryl in state waters, a memorandum of agreement (MOA) was signed by WGHOGA, Washington State Department of Ecology (WDOE), Washington State Department of Agricultural, Washington Department Fish and Wildlife (WDFW), and several other agencies and organizations to transition the industry towards IPM. The MOA described, prioritized, and provided timelines for nine tasks toward IPM development including the establishment of an IPM Committee (again comprised of representative from multiple agencies and organizations, and the establishment of an IPM Coordinator. All stipulations of the MOA have been complied with.

Many of these same items from the MOA were included in the previous NPDES permit issued in 2002 (No. WA0040975). Additional requirements in the permit included the submission of an Engineering Plan, a Biological Plan, an IPM Plan, a plan for a study of the authorization of the Sediment Impact Zone (SIZ) related to the carbaryl-based management plan, an Engineering Report, a Biological Report, a Fate and Transport Study, and the SIZ Report on or before specific dates, all of which were complied with. The IPM Plan, submitted in March 2003 identified additional steps to be taken for the development, evaluation, implementation of IPM tactics, and included definitions and concepts that place it within the general IPM paradigm as described by Kogan (1998). Specific tactics were not identified, but the plan provided a basis and forum to discuss program execution, research priorities, and evaluations of success, including response to regulatory agencies.

Despite its urgent need, an operational IPM program for burrowing shrimp is proving difficult to develop. Many IPM tactics that are standard in terrestrial systems, such as selective controls based on pest-specific growth regulators, mating pheromones, or other biorational compounds, are ineffective, too expensive, or not selective at all in a community comprised of annelids, molluscs, and crustaceans. The project also lacks the investigative and financial support that a pesticide registrant usually provides in other "reduced-risk" pest management programs. Most commercial oyster beds are accessible only by boat and difficult to work in when heavily infested with burrowing shrimp. Field research in the mud-flat is limited to maximum low tidal intervals of 3-4 hours duration that occur for only 2-3 consecutive days out of every 14, and occur in daylight only six months of the year.

Nevertheless, in the last three years, the WGHOGA has assembled a research team with expertise in agricultural engineering, mechanical engineering, mud flat ecology, biological control, shellfish culture, and IPM development. The WGHOGA has submitted proposals to several organizations and receive funds from the Sustainable Agriculture Research and Education – Western Region (WSARE), the University of WGHOGA Comments to NPDES Permit WA0040975 – p 3 Idaho - Washington State Aquaculture Initiative, the Washington State Commission for Pesticide Registration (WSCPR). Trials of "fast-track registration" (e.g., EPA's 25-B list) and other "reduced-risk" materials (e.g., aqua ammonium, Vitamin K, azadirachtin, elemental sulphur, and various salts), have demonstrated low efficacy, but

experiments in 2005 featuring subsurface injection of elemental sulphur and both pyrethroids and pyrethrums showed greater potential. Recently, a special Washington State Legislature Proviso granted $200,000 per year for at least two years specifically for the development of alternative management tactics. The resulting research program is greatly expanded from the efforts described above. Studies will address the biological control potential by indigenous natural enemies, parasitic nematodes, and a host-specific bopyrid isopod. The population distributions of burrowing shrimp will be mapped in relation to season, bay bathymetry, and shellfish cultural tactics by enhanced monitoring of not only adult burrowing shrimp, but also pelagic and juvenile stages and associated water quality variables. The proviso studies include efforts to culture burrowing shrimp to supply investigators year around with various larval stages of burrowing shrimp for laboratory experiments.

WASTEWATER CHARACTERIZATION

Reports, Reviews and Summaries

In compliance with the previous permit, the WGHOGA has submitted over a dozen reports to DOE. These include an annual operations plan and an annual report on the conventional carbaryl-based burrowing shrimp management plan, an integrated pest management plan, an engineering plan, a plan for the biological control of burrowing shrimp, a fate and transport of carbaryl study, and a study of the sediment impact zone (SIZ) related to the conventional carbaryl-based management plan. Efforts towards IPM are summarized above, but findings of the fate and transport study and the SIZ study are summarized below.

Water Quality Measurements

The fact sheet misrepresents WGHOGA's program to monitor water quality related to the carbaryl Applications. In fact, the WGHOGA has sampled 101 times, excluding duplicates, replicates, or field blanks. These include the 44 (not 40 as stated in the fact sheet) samples taken 24 hr post-application for acute limitations, but also ten samples taken pre-application for background concentrations and 47 samples at 30 days after spraying for chronic limitations. While the 8 exceedences of acute limitations were at different specific sample sites, all but three occurred among two general areas: the area comprising North Willapa Bay where the North River, Cedar River, and Willapa River all flowed into a heavily farmed area that is drained by a few major channels. These channels are sampled annually and represent an area where most exceedences occur. Recognizing this, the association has taken steps to lower exposure by spreading applications over more than a single tidal interval. In 2004, high densities of eel grass, resulting from abnormally high spring water temperatures, likely also accounted for high carbaryl concentrations in both the North Willapa Bay and in North Grays Harbor, where two other exceedences occurred. Only a single exceedence occurred in the Nemah area during the four years of sampling, and that was at a site directly over an exceptionally large bed (35 ac). No acute exceedences have occurred in the Oysterville, Nahcotta, or Stackpole areas located on the western side of the bay. A frequency distribution of carbaryl concentrations in the acute samples shows that 75% (33 of 44 samples) were below the acute limitation. All but two of the 47 samples for chronic limitations were non-detects. The two chronic samples with carbaryl detections were at concentrations too high to be accounted for by the applications for shrimp control.

The WGHOGA regrets any exceedence of water quality limitations, but please note again these water quality criteria were derived from limited data.

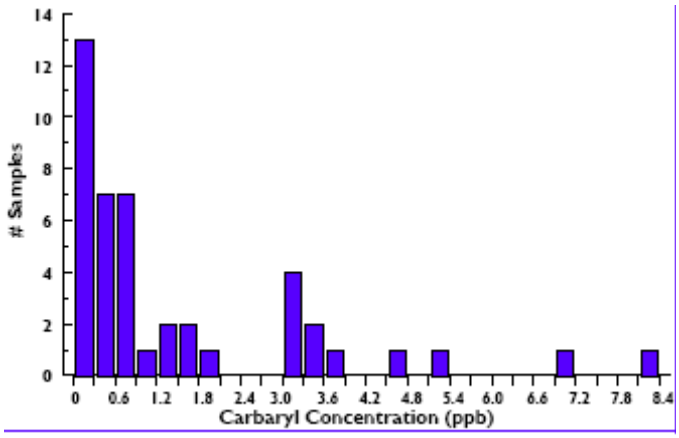
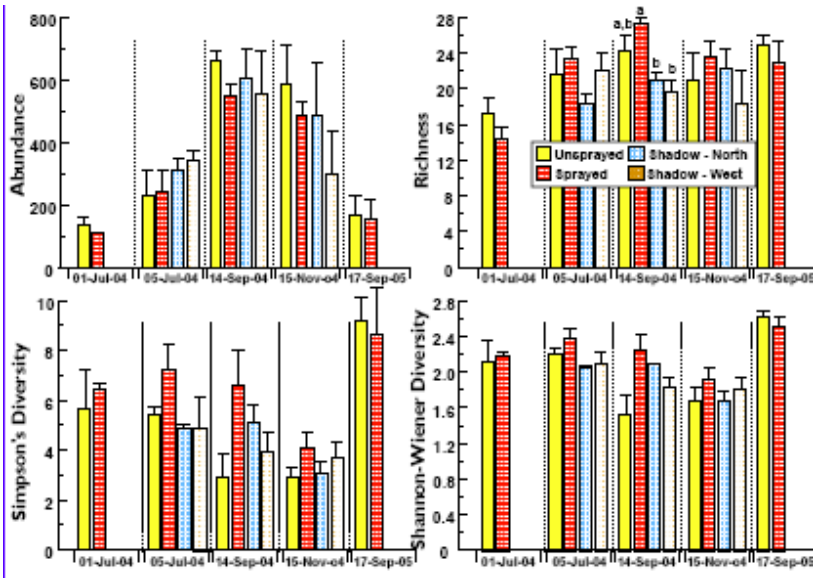


Figure uses WGHOGA data after Grue, 2005.

Sediment Impact Zone

The fact sheet, in efforts towards brevity, does not accurately, either the findings or the scientific rigor of the study. The SIZ Study featured comparisons of carbaryl concentrations, sediment composition, and benthic invertebrates in an area treated with an aerial application of Sevin, two adjacent "shadow zones" and a nearby untreated area. Samples were taken pre-treatment and at 3, 74, 136, and 442 days after treatment. Three samples were collected per replicate and three replicates were sampled per area. Sample sizes were found reasonably precise by comparisons with some collections that featured more samples and replicates. During the course of the study, 18717 individual organisms from the study area were sorted, counted and identified to 67 taxa, 40 of which were to the species level. Percentage of silts in sediments was higher in the SIZ Study than in others, suggesting carbaryl would be slower to dissipate. Nevertheless, as in all three other studies, carbaryl in sediments from the treated area declined logarithmically or exponentially to levels below detection (0.33 ppb) within 240 days. According to analyses of variance, seasonal effects impacted the community of benthic invertebrates, as represented by total abundance, number of species, and two measures of diversity, more often than spray effects. Both measures of diversity, were significantly higher at 442 days after treatment than they had been the previous fall. Almost all of the community measures did not differ significantly among the treatment areas (see figure). Species richness was significantly greater in the sprayed area than in the other areas on 14 September '04. Within the polychaetes, molluscs, and crustaceans, Simpson's diversity did not differ significantly between sprayed and unsprayed areas at any sample date. The relative abundance of most benthic invertebrates did not shift substantially among sample dates. These results are similar to those of other studies and indicate that many benthic organisms, especially polychaetes, are less susceptible to carbaryl than are burrowing shrimp. They are also able to recolonize a sprayed area relatively quickly and, in the absence of severe disruption of the sediment aused by burrowing shrimp, establish an abundant and diverse benthic community. Burrowing shrimp modify the habitat such that only themselves or other very specialized, or very adaptable, species can survive. Species diversity changes little, or actually increases, upon their removal because diversity was low to begin with. Unfortunately, burrowing shrimp themselves quickly (<5 years) reinvade ground after their removal, and diversity will again decline. The impact of carbaryl on the benthic infauna is in essence a reflection of its impact on burrowing shrimp.



Additional considerations

The WGHOGA suggests the following study also be included for consideration of the impacts of carbaryl and that it contribute to AKART development. An abstract is presented here:

Exposure of Salmonids to Carbaryl Following Applications to Control Burrowing Shrimp in Willapa Bay, Washington. Major, W.W. III1, Grue, C.E., Grassley1, J.M., Cabarrus, J.L.1, Curran, C.A.1, Overman, N.C.1 and Dumbauld, B.R.

1Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle, WA; 2Washington Department of Fish and Wildlife, Nachotta, WA

Abstract: Recent efforts to restrict/prohibit the use of carbaryl to control burrowing shrimp (Neotrypaea californiensis and Upogebia pugettensis) have been in part driven by concerns over effects on salmonids documented in laboratory studies, and not actual exposure during operational applications. Data on the actual exposure of salmonids to carbaryl are lacking, threatening the permitting process and control operations. In summer 2003, we studied the use of treated areas by salmonids in an effort to quantify their actual exposure to carbaryl. Use of the water column above oyster beds by salmonids was determined on the first daylight high tide at each of three oyster beds (10-25 ac) preceding two carbaryl spray events (2 and 14 July 2003), and during each of the three subsequent daylight high tides (ca. 6, 30, and 54 h after treatment). Sampling methods included use of a two-boat trawl net and gill nets. The only salmonid captured before and after treatment were juvenile chinook (Oncorhynchus tshawytsha). Juvenile Chinook were captured on all sites and all sampling periods. Concentrations of carbaryl before each of the two spray events were < 1 ppb (ND, below detection limits); concentrations after spray ranged from ND to 11.3 ppb. These levels are 2-3 orders of magnitude below levels lethal to chinook (LC50 carbaryl = 2,400 ppb, LC50 1-naphthol = 1,400 ppb [rainbow trout]). Brain AChE assays showed statistically significant levels of inhibition (mean = 10%) during the first tide post treatment on one spray event with recovery to pre-spray levels of AChE by the second tide post-treatment. Both spray events showed significant increases (mean = 7-8%) in AChE levels by the third tide post treatment. Our results suggest that juvenile chinook are being exposed to low levels of carbaryl over at least 50 h, but are not exhibiting levels of AChE inhibition associated with mortality (> 70%) or overt behavioral effects (> 30%).

Sincerely,

Steve Booth, Ph.D.
IPM Coordinator

Tim Morris,
President, WGHOGA

Ecology Response 28

Ecology received and reviewed the comments submitted by the WGHOGA on general history, integrated pest management, wastewater characterization and additional information considerations. Ecology has not made changes to the fact sheet. This information submitted by WBGHOGA will be part of public record.

Comments received May 26, 2006 via e-mail from Kim Patten of Washington State University, Long Beach Research and Unit.

Comment 29

The oyster industry is a vital sustainable industry to SW coastal Washington. The ability to control burrowing shrimp is critical to its continued survival. The industry has vigorously sought to find alternative management solutions to carbaryl and has a major research to seek alternatives to carbaryl. That research effort is being conducted by researchers from University of Washington, Washington State University, University of Idaho, Oregon State University, Pacific Shellfish Institute and the USDA. Our approach is integrated across basic and applied sciences. We are evaluating all aspects of chemical, physical and biological control. We, as researches, hope to be successful in finding new management method in the near future. This NPDES permit is a vital part of that research effort. In fact, the ability to continue several research projects is contingent on obtaining this NPDES permit. Without the NPDES permit, our research effort will be severely curtailed and it is unlikely that new alternative management methods will be developed.

Ecology Response 29

Comments noted.

APPENDIX E – PESTICIDE APPLICATION RECORD

State of Washington
Department of Agriculture
Olympia, Washington 98504

PESTICIDE APPLICATION RECORD (Version 3)

NOTE: This form must be completed same day as the application and it must be retained for 7 years (Ref. RCW 17.21)

1. Date of Application - Year: ..... Month: ..... Day(s): .....
2. Name of Person for whom the pesticide was applied: .....
   Firm Name (if applicable): .....
   Street Address: ..... City: ..... State: ..... Zip: .....
3. Licensed Applicator's Name (if different from #2 above): ..... License No. .....
   Firm Name (if applicable): ..... Tel. No. .....
   Street Address: ..... City: ..... State: ..... Zip: .....
4. ❑ Air ❑ Ground ❑ Chemigation
5. Application Crop or Site: .....
6. Total Area Treated (acre, sq. ft., etc.): .....
7. Was this application made as a result of a WSDA Permit? ❑ No ❑ Yes (if yes, give Permit No.) # .....
8. Pesticide Information (please list all information for each pesticide in the tank mix):

a) Product Name	b) EPA Reg. No.	c) Total Amount of Pesticide Applied in Area Treated	d) Pesticide Applied/Acre (or other measure)	e) Concentration Applied
			/	
			/	
			/	
			/	
			/	

9. Address ***or exact location*** of application. NOTE: if the application is made to one acre or more of agricultural land, the field location must be shown on the map on page two of this form.

10. Date	11. Name of person(s) making the application	12. License No.	13. Apparatus Lic. Plate No.	14. Time Start	Stop	15. Acres Completed	16. Wind Dir.	Vel.	17. Temp

AGR 4236 (Rev. 4/99)

10. Date	11. Name of person(s) making the application	12. License No.	13. Apparatus Lic. Plate No.	14. Time		15. Acres Completed	16. Wind		17. Temp
				Start	Stop		Dir.	Vel.	

Location of Application (If the application covers more than one township or range, please indicate the township & range for the top left section of the map only:

Township: ..... N

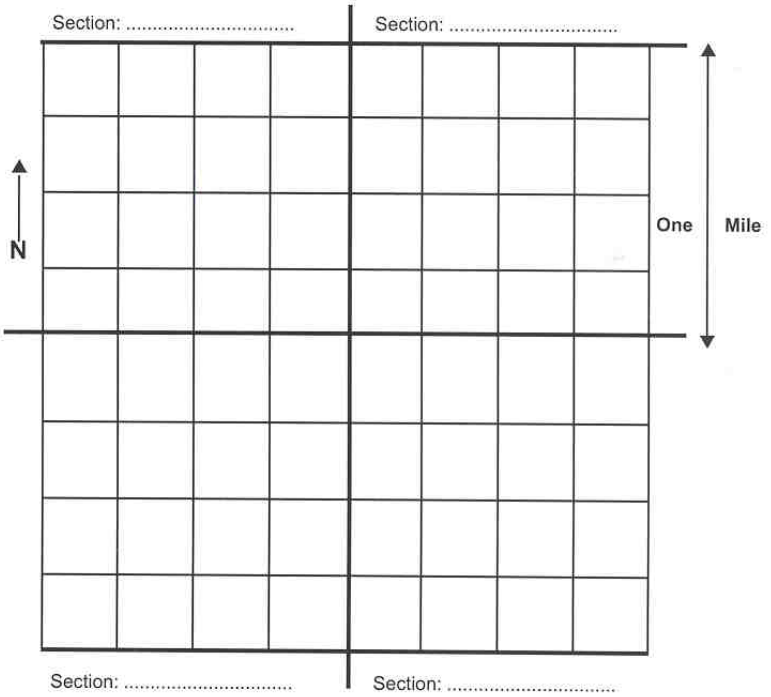
Range: E OR W (please indicate) .....

Section(s): .....

County: .....

PLEASE NOTE:

The map is divided into 4 sections with each section divided into quarter-quarter sections. Please complete it by marking the appropriate section number(s) on the map and indicate as accurately as possible the location of the area treated.



Miscellaneous Information:

AGR 4236 Pg. 2

INSTRUCTIONS

Pesticide Application Record (Version 3) AGR 4236 (Rev. 4/99)

1. Date may be spelled out or indicated numerically. Time may be indicated as start and stop times.
2. Please include first and last name.
3. If the person's name is the same as No. 2, please write "same" in the space for the licensed applicator's name and include the license number (if applicable) and telephone number.
4. Please check one.
5. Indicate type of land or site treated, not location. Examples: wheat, apples, rights-of-way, lawn, trees and shrubs, crawl space, wall voids, etc.
6. May also be stated in terms such as linear feet, cubic feet, etc. (Please specify the term to which the number refers.)
7. If the application was made under permit, but no permit number was issued, please indicate the date the permit was issued.
8. a) Brand name found on the pesticide label.

   b) This number is found on the pesticide container label. If the material is being applied under a federal experimental use permit and no EPA Reg. No. exists, please list the federal experimental use permit number. If the material is a spray adjuvant (buffer, spreader, sticker, etc.) please write "adjuvant" in this space.

   c) Indicate the amount of pesticide formulation (product) applied to the total area listed on line 6.

   d) Other measures may include amount/sq. ft., amount/cu. ft., amount/linear ft., etc.

   e) This may be listed in various ways, such as: amount of formulation/100 gallons water, percent formulation in the tank mix (i.e. 1%), amount of tank mix/acre (or other measure). Please specify the term to which the number refers.
9. Agricultural land includes such areas as forest lands and range lands. It does not include transportation and utility rights-of-way.
10. List the day of application
11. Please indicate first and last name(s).
12. List license number(s) if applicable.
13. This does not apply to private applicators or public agencies.
14. Indicate a.m. or p.m.
15. The total of all entries in this column should equal the total listed on line 6.
16. Indicate the direction from which the wind is blowing. If the wind varies in direction and velocity during the application, please indicate the range of variance (i.e. S-SW 3-7 mph).
17. Please indicate temperature in degrees Fahrenheit. (It may be indicated as the range encountered during the application.)