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LETTER TRANSMITTING REQUEST FOR UNDERGROUND INJECTION CONTROL VARIANCE FOR POTASSIUM PERMANGANATE TREATMENT NTC ORLANDO FL
6/7/1999
HARDING LAWSON ASSOCIATES

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Harding Lawson Associates

June 7, 1999

Document No.: 2545.028

Commanding Officer
SOUTHNAVFACENGCOM
ATTN: Ms. Barbara Nwokike, Code 187300
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, SC 29406

SUBJECT: **Potassium Permanganate Treatability Study – Operable Unit 4**
Request for Underground Injection Control Variance
Naval Training Center (NTC), Orlando, Florida
Contract No. N62467-89-D-0317/CTO 135

Dear Barbara:

Enclosed please find copies of the request for variance to allow injection of potassium permanganate in groundwater at OU 4. The request has already been forwarded to the state of Florida. The variance is necessary because certain Florida secondary standards will be exceeded in the injected solution. The permanganate dosages planned for OU 4 will be low enough to avoid exceedance of any primary standards.

If you have questions or comments regarding this document, please contact me at (781) 245-6606 or John Kaiser at (407) 895-8845.

Very truly yours,

HARDING LAWSON ASSOCIATES

Mark J. Salvetti

Mark J. Salvetti, P.E.
Task Order Manager

Enclosure

cc:

W. Hansel (SDIV)
D. Grabka (FDEP)
N. Rodriguez (USEPA)
R. Manning (BEI)
A. Aiken (CH2M HILL)
G. Whipple (NTC Orlando)
S. McCoy (Tetra Tech NUS)
R. Allen (HLA)
J. Kaiser (HLA)
File

Harding Lawson Associates

June 7, 1999

02545.027

Kathy Carter, Agency Clerk
Florida Department of Environmental Protection
Office of General Counsel
Mail Station 35
3900 Commonwealth Blvd.
Tallahassee, FL 32399-3000

Subject: Petition for Variance

Dear Ms. Carter:

Enclosed you will find a petition for Variance from Rule 52-522.300(2)(a), Florida Administrative Code. Harding Lawson Associates requests this variance for the use of In-Situ Chemical Oxidation with Potassium Permanganate in an aquifer remediation design document. By granting this petition, many remediation projects throughout Florida will benefit through the use of this promising technology.

Please feel free to contact me at (781)245-6606 should you have any questions regarding this technology or this petition.

Sincerely,

Harding Lawson Associates

Mark J. Salvetti

Mark J. Salvetti, P.E.
Project Manager

cc: D. Grabka, Waste Cleanup
W. Neimes, Waste Cleanup
G. Brown, Waste Cleanup

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BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

IN RE: HARDING LAWSON ASSOCIATES
PETITION FOR VARIANCE

PETITION FOR VARIANCE
FROM RULE 62-522.300(2)(a), FLORIDA ADMINISTRATIVE CODE

Petitioner, Harding Lawson Associates, pursuant to Section 120.542, Florida Statutes, and Rule 28-104, Florida Administrative Code, hereby petitions for a variance from Rule 62-522.300(2)(a), Florida Administrative Code, because the strict application of this rule will create a substantial hardship and will violate principles of fairness. In support thereof Petitioner states:

Background Facts

1. Petitioner is Harding Lawson Associates, (HLA) located at 1080 Woodcock Road, Suite 100, Orlando, Florida 32803, telephone (407) 895-8845, facsimile (407) 896-6150.
2. Research conducted by the University of Waterloo, Canada, and Oak Ridge National Laboratory, has led to the finding that In-Situ Chemical Oxidation using Potassium Permanganate can be an effective remediation technology at sites contaminated with compounds susceptible to oxidation by Potassium Permanganate, including chlorinated solvents. When the Potassium Permanganate solution contacts the contaminant molecules, the molecular bonds are broken (i.e., the contaminant is oxidized). The by-products of this reaction are potassium, carbon dioxide, manganese dioxide, and chloride ions.
3. Laboratory and field tests of In-Situ Chemical Oxidation with Potassium Permanganate have demonstrated remarkable success in quickly reducing contaminant concentrations.
4. When Potassium Permanganate is added to groundwater, the secondary groundwater standard for color may be temporarily exceeded. It is also possible that the secondary standards for Total Dissolved Solids, aluminum, manganese, silver, and perhaps chloride (when high concentrations of chlorinated compounds are oxidized) could be temporarily exceeded. Injection of Potassium Permanganate violates no primary groundwater standards.

The Rule

5. Rule 62-522.300(1) provides that:
   No installation shall directly or indirectly discharge into groundwater any contaminant that causes a violation in the water quality standards and criteria for the receiving groundwater as established in Chapter 62-520 except within a zone of discharge established by permit or rule pursuant to this chapter.
6. Furthermore, Rule 62-522.300(2)(a) provides that:
   (2) No zone of discharge shall be allowed under any of the following circumstances:

(a) Discharges through wells or sink holes that allow direct contact with Class G-I or Class G-II groundwater, except projects designed to recharge aquifers with surface water of comparable quality, or projects designed to transfer water across or between aquifers of comparable quality for the purpose of storage or conservation.

7. Pursuant to Rule 62-520.420, the water quality standards for Class G-I and G-II groundwater are the primary and secondary drinking water quality standards as set forth in Rules 62-550.310 and 320, and the minimum criteria provided in Rule 62-520.400, F.A.C.

8. The relevant water quality standards as provided in Rules 62-550.320 and 62-520.400 are:

Parameter	Standard
pH	6.5 to 8.5
Color	15 color units
Total Dissolved Solids	500 mg/l
Aluminum	200 µg/l
Manganese	50 µg/l
Molybdenum	35 µg/l (Rule 62-520.400)
Silver	100 µg/l
Chloride	250 mg/l

9. Rule 62-522.300(2)(a) implements Sections 403.021, 403.061, and 403.088, Florida Statutes, and has as its specific authority in Section 403.061, Florida Statutes.

Type of Action Requested

10. HLA is requesting a variance from the restrictions imposed by Rule 62-522(2)(a) that would prohibit the Department from granting a zone of discharge in conjunction with the approval of Remedial Action Plans proposing the use of In-Situ Chemical Oxidation with Potassium Permanganate.

Specific Facts Which Demonstrate a Substantial Hardship
Or Violation of Principles of Fairness

11. The concentration of Potassium Permanganate in the injected fluid is a maximum 7.6 g/l (Free Flow grade) or 11.6 g/l (Pharmaceutical Grade), based on the concentration of inorganics with primary standards in the Potassium Permanganate solution. The actual grade and concentration used will be dependent on the effectiveness of the oxidation reaction observed in the field. The compositions of the potential Potassium Permanganate solutions are shown in Attachment A.

These concentrations exceed the secondary standard for Total Dissolved Solids. During the reaction, Manganese Dioxide is generated. In unfiltered samples, this precipitate has the potential to exceed the secondary standard for Manganese. Dissolved concentrations of aluminum (Free Flow grade) or aluminum and silver (Pharmaceutical Grade) may also exceed secondary standards. Depending on the contaminant oxidized, there is also the potential to generate acids and/or bases which may temporarily alter the pH of the groundwater. The buffering capacity of Florida's aquifers will quickly neutralize this condition. Upon injection of the Potassium Permanganate into the contaminant plume, it is expected that the color of the groundwater will turn purple. As the oxidation process proceeds, the groundwater will turn pink

and then clear again depending on the site stratigraphy, contaminant distribution, and the injection scenario. It is expected that through oxidation, dilution, diffusion, and advection, the groundwater color will be reduced to less than 15 color units or to background levels.

The above exceedances are possible in an area extending up to 100 feet from the point of injection. Conditions in the aquifer are expected to return to background within 365 days. Active remedial measures can be implemented if secondary standards continue to be exceeded beyond this period.

12. Pursuant to Rule 62-528.300(1)(e)4, the type of injection well to be utilized in the Potassium Permanganate In Situ Oxidation Process is a Class V, Group 4 well – "injection wells associated with an aquifer remediation project shall be authorized under the provision of a remedial action plan...provided the construction, operation, and monitoring requirements of the Chapter are met." There is no dispute that the subject injection wells will meet the construction, operation, and monitoring requirements of Chapter 62-528.
13. The staff of the Department's Bureau of Waste Cleanup and Bureau of Petroleum Storage Systems are familiar with In-Situ Chemical Oxidation with Potassium Permanganate and are prepared to approve its use at sites contaminated with petroleum compounds and chlorinated solvents. However, the provisions of Rule 62-522.300(1) would appear to prohibit the injection of Potassium Permanganate except within a Zone of Discharge. Rule 62-522.300(2)(a) prohibits the Department from granting a zone of discharge through an injection well to Class G-I and G-II groundwater.
14. Strict adherence to the prohibition of Rule 62-522.300(2)(a) would preclude the Department from granting approval for the use of In-Situ Chemical Oxidation with Potassium Permanganate.
15. Rule 62-522.300 is designed to protect the underground sources of drinking water of clean aquifers. However, the prohibition of a zone of discharge for an injection well to Class G-I and G-II groundwater is a hindrance to a reasonable, common sense remediation process that may cause only a temporary exceedence of a secondary drinking water standard in what is already a highly contaminated aquifer.
16. In-Situ Chemical Oxidation can accomplish the remediation of contaminated aquifers more effectively, more quickly, and potentially, at much lower cost than traditional remediation technologies. Therefore, a strict adherence to the zone of discharge prohibition will prevent the use of a safe, effective, and cost efficient remediation technology.

<u>The Requested Variance Will Serve the Purposes of the Underlying Statute</u>

17. As set forth in Section 403.021(2), Florida Statutes:
It is declared to be the public policy of this state to conserve the waters of the state and to protect, maintain, and improve the quality thereof for public water supplies, for the propagation of wildlife and fish and other aquatic life, and for the domestic, agricultural, industrial, recreational, and other beneficial uses and to provide that no wastes be discharged into any waters of the state without first being given the degree of treatment necessary to protect the beneficial uses of such waters.
18. There are no adverse impacts on human health or the environment that result from colored water. Temporary exceedance of the secondary standards for chloride, aluminum, manganese, silver, and total dissolved solids are also not expected to present any adverse impacts. The buffering capacity of Florida's aquifers is expected to prevent violations of the secondary standard for pH. The temporary exceedence of the secondary drinking water standards in connection with the

remediation of contaminated groundwater will not only allow for the protection and conservation of public water supplies, but will have the net effect of improving those public water supplies. Granting the variance will allow for the more effective cleanup of contaminated public water supplies. Therefore, the variance requested herein will serve the purpose of the underlying statute.

Conclusion

19. Rule 62-522.300(2)(a) precludes the Department from approving the use of an innovative site remediation technology that can more quickly and effectively clean up groundwater at sites contaminated with petroleum compounds and chlorinated solvents. The use of this technology will not cause any adverse impacts to the potential underground drinking water sources, but, in fact, will contribute significantly to improving the quality of those sources.

WHEREFORE, HLA requests that the Department grant a variance from Rule 62-522.300(2)(a) and allow the Department to approve a temporary zone of discharge for any Pilot Study Plan, Remedial Action Plan, or any other plan proposing the use of In-Situ Chemical Oxidation utilizing Potassium Permanganate with the condition that no Site Rehabilitation Completion Order will be granted unless the site meets all applicable, or approved cleanup target levels including color, aluminum, silver, manganese, chloride, total dissolved solids, and pH or their respective site-specific background concentration, whichever is less stringent. The approval document generated by the Department shall detail the physical limits of the permitted zone of discharge.

Respectfully submitted this 7 th day of June, 1999.

Mark J. Salvetti, P.E.
Senior Engineer
Harding Lawson Associates

ATTACHMENT A

KMnO4 INORGANIC CONSTITUENTS		
Analyte (µg/l)	**Free Flow Solution Concentrations at Maximum 7.6 g/l**	**Pharmaceutical Grade Concentrations at Maximum 11.6 g/l**
Aluminum	600	660
Antimony	0.8	0.8
Arsenic	41	9.7
Barium	23	315
Beryllium	<0.5	<0.8
Boron	35	62
Cadmium	<2.5	<3.9
Chloride	<0.1	73
Calcium	646	27
Chromium	99	96
Cobalt	27	44
Copper	127	12
Iron	176	23
Lead	<0.5	3.1
Magnesium	34	39
Manganese	2,640,100	4,029,600
Mercury	0.30	1.1
Molybdenum	70	<21
Nickel	<5.0	<7.7
Potassium	1,880,300	2,869,900
Selenium	0.38	1.5
Silica	11,080	205
Silver	18	160
Sodium	3,740	1,140
Sulfate	0.1	615
Strontium	8	<0.4
Thallium	<0.5	<0.8
Zinc	37	16
pH	8.5 to 9.5	8.5 to 9.5