

Attachment 4

Dive Policy Report of Review of DWR Dive Policy

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

2007 Diving Policy Review

By:

BOARD OF CONSULTANTS

**James Stewart
Fred Aichele
Frank McGinnis
Anthony Traina**

August 14, 2007

Diving Policy Review

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Report of Department of Water Resources Diving Policy Review

Executive Summary

In March of 2007 the DWR announced the formation of an independent expert panel to review the safety of its dive program.

The panel is chaired by Jim Stewart, Chief Diving Officer Emeritus of Scripps Institution of Oceanography in La Jolla. Other members of the panel are Frank McGinnis, Fred Aichele and Anthony Traina.

Frank McGinnis is a retired assistant dive coordinator and trainer for Metropolitan Water District whose diving policies are similar to DWR's. Fred Aichele is a retired U.S. Navy master diver. Following his 22 year career diving for the Navy, Aichele ran his own commercial diving company and has been a consultant for commercial diving services for the past 24 years. Anthony Traina is a Diving Supervisor and a Senior Bridge Engineer with the California Department of Transportation. He has been on the Caltrans dive team for more than 14 years and is a member of their Dive Safety Board.

As outlined in the contract documents, this review panel was asked to provide a comprehensive assessment of DWR's Diving Program, including but not limited to comments and recommendations on the following items:

- ST-9 "Diving Policy" - Adequacy and applicability of DWR's Diving Policy and procedures to address the type diving historically performed in SWP facilities, by both DWR divers and contracted divers.
- Safe Diving Procedures
- Type of diving performed by DWR divers
- DWR's Diver Training
- Reporting

An abbreviated summary of the Panel's findings follow on this page. More detailed findings and recommendations are included on the follow pages.

- The ST-9, "Diving Policy", while containing contradictions and in need of updating and revisions, was marginally adequate. However, the Panel also found that the procedures covering DWR's diving were not universally applied.
- The Panel found that the ST-9 will need to be revised to be adequate for and applicable to both DWR's and Contracted Divers.
- By not following the ST-9 and OSHA, DWR's diving procedures were found to be unsafe at times. For example, use of non-qualified tenders, divers are not line tended in velocities over 1 knot, divers routinely lose continuous visual communications with dive buddy and continue the dive, making penetration dives without proper safety lines.

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- Management was not familiar with the overall aspects of the diving operations.
- The panel agrees that no Scientific Diving, as defined by Cal OSHA and Fed OSHA, is performed by DWR divers.
- DWR's Divers were all initially trained using basic SCUBA equipment. The Panel agrees that the type of diving performed by DWR's Divers requires a higher level of training and additional equipment.
- The Panel found that diving related forms were not adequate for the intended purposes, were not routed according to ST-9 and were routinely incomplete. Formal diving logs are not completed and maintained by dive crews.
- The Panel found the Diving Safety Board to be non-functional as noted below.
- The Panel found instances where flow conditions were changed while divers were in the water. It was also noted that the staff at the POC, ACC and Plant Operators were not familiar with basic diving operations and the significance of making operations changes during diving operations.

Findings and Recommendations

The panel recommends that DWR implement the following recommendations. These recommendations are further detailed in the remainder of this report:

1. Appoint a full-time Dive Coordinator whose qualifications include a thorough understanding of the operation of the State Water Project and minimum of 5 years diving and 5 years experience within the SWP.
2. Build a strong five or six person full time dive team.
3. Strengthen and enforce communications between the diving coordinator, dive crew, ACC, POCC, plant operators and O&M HQ.
4. All plant and water operators shall be made familiar with the diving policy and diving operations at their facilities and complete refresher training on a regular basis.
5. Follow Cal OSHA/Fed OSHA regulations whichever is more stringent. The panel recommends that until Cal OSHA is updated, Fed OSHA should be adhered to for the safety of the divers.
6. Management should familiarize themselves with the overall aspects of the dive operations and be able to make informed decisions concerning the diving program.
7. Update and rewrite ST-9 Diving Policy (Dive Safety Manual).
8. No diving within 100 feet of an operating pump bay.
9. All dives in the canal, including pumping plants and turnouts, shall be performed by a tethered diver with full-time communications. Dives in other

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areas should be evaluated on a case by case basis to determine the appropriate dive mode.

10. All dive crew members must be qualified divers.
11. No operational or flow changes while divers are in the water.
12. Locks are to be used in all lockout tagout procedures.
13. Tow companies removing vehicles from the canal must have a DWR representative who is familiar with the dive policy onsite and must abide by the DWR dive policy.
14. The diving supervisor shall verify that on-site communications are available with the area control center before commencing dive operations.
15. As discussed below in "Recommended Revisions to ST-9", disband the diving safety board. Utilize a 3 man policy review committee on an annual basis.

Type of Diving Performed by DWR Divers

After reviewing DWR's diving operations and policy, the Panel found none of your diving fell under the scientific diving exemption of OSHA. This exemption requires that divers are scientist or scientist in-training and are solely performing scientific research. OSHA also requires that scientific diving operations be under the control of an active Diving Safety Board.

The panel recommends all DWR dives in the future be in compliance with Cal OSHA or Federal OSHA regulations, whichever is stricter.

Organizational Recommendations

DWR's Dive Team currently consists of members spread throughout the state. These members have other job duties that at times make it difficult for a complete dive team to be assembled to perform a requested dive. This practice may also preclude divers from diving frequently, interacting with other team members, and becoming familiar with new equipment. This practice also facilitates using non-qualified tenders which is a safety concern.

After review of DWR's program the Panel discussed the following likely options:

- Maintaining in-house dive capabilities to perform inspection work only.
- Maintaining in-house dive capabilities to perform all potential work.
- Contracting outside diving services to provide supplemental services as necessary.

Regardless of how diving is accomplished the Panel recommends that DWR shall staff a full time Dive Coordinator whose job is to coordinate all diving under the auspices of DWR. This Coordinator shall have diving experience, experience in the operation of the SWP, and will be in full charge of all dive operations. The Dive Coordinator shall have one person in O&M HQ to report to as noted below.

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The Panel recommends that DWR have one person in O&M HQ who is responsible for general oversight of the diving program. This person provides administrative support to the diving program and has a general knowledge of the overall diving operations.

If DWR is to maintain in-house diving for the purposes of inspection work only, it is recommended that one five or six man dive crew cover the entire DWR system. These divers should be full time with no other job duties. The Panel felt that either SCUBA systems or surface supply air systems will work well for inspection dives, depending on the environmental conditions. Existing SCUBA equipment shall be updated to provide for a tethered diver with full time communications. The use of surface supply air systems will require additional equipment and training in the use of these systems. This training would be best accomplished by sending the dive crew to a commercial diving school.

If DWR is to maintain in-house diving capabilities to perform all potential work, it is also recommended that one five or six man dive crew cover the entire DWR system. This dive crew shall be outfitted with the necessary surface supplied diving equipment, tools, vehicles and boats. The use of surface supply air systems will require additional training in the use of these systems. This training would be best accomplished by sending the dive crew to a commercial diving school.

The estimated cost for equipping a full time 6 man dive crew and a full time diving coordinator would be \$400,000 for equipment and estimated yearly burdened costs for personnel of \$720,000. The equipment included in this rough estimate includes diving helmets and umbilicals, dry suites, recompression chamber, air compressors, dedicated dive boat, boom truck, support vehicles. This cost will need to be revised based on the actual classifications of the diving staff. Facility costs are not included.

Recommended Revisions to ST-9

The Panel recommends that ST-9 be updated and revised. The following minimum items should be incorporated:

Diving Safety Board

- DWR revealed to the review panel that the Diving Safety Board, for the past several years has not been fulfilling the responsibilities of the board outlined in ST-9. Dive team meetings have replaced Diving Safety Board meetings over time. Most of the Diving Safety Board responsibilities are already being handled by individuals.
- For these reasons, the panel feels that DWR should disband the diving safety board. The panel felt that a knowledgeable diving coordinator could assume the responsibilities of the board as outlined in ST-9 in a more efficient manner.
- Utilize an outside policy review committee on an annual basis to ensure DWR policy is in line with general diving industry practices.

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Communications

The panel agreed that communication needs to be improved between dive teams, management, control centers and plant operators. It is recommended that the dive request, approval, and reporting process be reviewed and updated. The Panel recommends that the following items be incorporated in the new process:

- Strengthen and enforce communications between the diving coordinator, dive crew, ACC, POC, Plant and Water Operators and O&M HQ. New protocols should be developed as necessary.
- All dive requests and dive reports shall go to the Dive Coordinator for approval.
- The Operations Chief for each field division shall review all dive requests to make sure the operational mode needed for the dive can be complied with.
- The approved copies of the dive request shall be in the possession of the dive coordinator prior to commencement of any dives.
- The Dive Coordinator shall handle all requests for clearances, lock out/tag out procedures, and flow requirements for all dives.
- The Dive Supervisor shall have full control over the job site and flow conditions.
- The Dive Supervisor must have direct communication with the area control center and/or plant operators at all times on all dives.
- No operational changes shall be made while divers are in the water.
- All changes must be approved by the Dive Coordinator and Dive Supervisor.
- All divers should be out of the water before any changes in operational mode or flow conditions are implemented.
- As previously recommended, all plant and water operators shall be made familiar with the diving policy and diving operations at their facilities and complete refresher training on a regular basis.

Diving Operations

- No dives shall be made within 100 feet of an operating pump bay. No inspections or work shall be performed in these areas unless the pumps are shut down, locked out, and tagged out.
- No diving shall be performed when water velocities exceed 3 feet per second. DWR engineering staff can develop average water velocity tables based on flow rates for each section of the canal. In addition handheld water velocity measuring devices should be standard dive team equipment.
- All dives in the canal, including pumping plants and turnouts, shall be performed by a tethered diver with full time communications. Dives in other areas should be evaluated on a case by case basis to determine the appropriate dive mode.

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- All DWR diving shall use a minimum of three man dive crew with the following make-up: Dive supervisor, Diver, and Tender. Although three persons is the minimum crew size, in most cases a four person team works much better. The diving supervisor shall not be a diver unless replaced by a qualified dive supervisor.
- All dive crew members, including tenders, must be qualified divers. If DWR is to maintain an in-house dive team, the qualifications and roles and responsibilities for all dive team members (entry level through dive supervisor) will have to be developed. The panel recommends following industry standards such as the ADC consensus standards.
- All dive operations shall have a job safety analysis form filled out and the divers must be briefed on job safety before each dive. This meeting should include the operations staff when appropriate, such as diving at pumping plants.
- Each dive will have the following form or report completed and signed by the appropriate persons:
 - Dive Request
 - Clearance or Lock out/Tag out
 - Job Safety Analysis
 - Diver Log (Use standard dive logs)
 - Final Dive Report
- All current DWR forms shall be reviewed and updated as necessary.

Contract Diving

- All diving contractors shall have a California State Contractors license.
- All diving will be in accordance with the ADCI Consensus Standards.
- The contractor must also carry insurances as per DWR's specifications.
- The diving coordinator shall conduct a safety audit prior to the award of the contract. A suggested audit format has been provided in a separate transmittal.

Lockout/Tagout Procedures

- The diving coordinator shall coordinate the lockout/tagout for each dive when required.
- Locks are to be used in all lockout tagout procedures.
- The diving coordinator or dive supervisor will maintain control of the keys of the tagout locks for the duration of the diving operation.

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Vehicle Removal

- Tow companies removing vehicles from the canal must have a DWR representative onsite and must abide by the DWR dive policy.

Safety Regulations

All diving shall be in accordance with Cal OSHA or Fed OSHA regulations, whichever is stricter.

For general diving guidance other references that can be used are US Navy Diving Manual (Current Edition), National Oceanic and Atmospheric Administration (NOAA) Diving Manual, and the Association of Diving Contractors International (ADCI) consensus standards.

Equipment

If DWR is to maintain a diving capability, all diving equipment shall be maintained as per manufacturers' instructions. In this case, DWR's Dive Coordinator shall keep all record and reports on all diving equipment.

All service and repair work shall be performed by factory authorized service representatives and be tested prior to going back into service.

The DWR Dive Coordinator shall approve all new or replacement equipment and ensure all divers are trained in its use.

Certifications

The DWR Dive Coordinator should keep a record for each diver. This record should have the current dive certification, current diving physical, first aid, CPR, AED and oxygen provider certifications. Copies of any other required certifications and records of training shall also be maintained.

Training

If DWR is to keep in-house diving for the purpose of inspection only, the following minimum requirements shall be met for each diver:

Entry level requirements and certification

1. Pass medical diving examination
2. Pass DWR swim test
3. Basic SCUBA course
4. Basic Surface Supplied Diving
5. CPR, First Aid, AED, oxygen provider and any other required classes

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For all divers on the Dive Team

1. Each diver should make a minimum of one dive per month working to stay current.
2. Complete annual refresher training for CPR, First Aid, and Oxygen Provider and additional as needed.
3. Have diving safety meetings once a month and weekly tailgate safety meetings (not necessarily diving related).

If DWR is to develop in-house dive capabilities to perform all potential work, commercial dive training by a professional dive school would be required.

July 20, 2007

Mr. Raphael Torres
Duputy Director, Department of Water Resources
State of California
1416 Ninth Street
Sacramento, CA 95814

Subject: State Water Project Diving Policy Review

Dear Mr. Torres:

In accordance with our individual contracts with the Department of Water Resources, this Board of Consultants has completed its initial task of an independent review of DWR's diving policy and procedures.

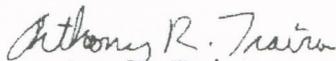
The report that accompanies this letter is a consensus of this committee and is based on our visits to various locations, interviews with dive team members and material provided by the Department staff during our meetings between April 25, 2007 and May 2, 2007. Also included in our report are observations made by the Board members during our site visits.

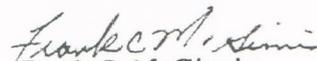
The Board finds that while your dive personnel are willing and eager to accomplish their assigned underwater tasks, the ST-9 Diving Policy along with other procedures contain contradictions, are in need of updating and are just marginally adequate. We also found that the procedures covering DWR's diving were not universally applied to diving operations.

The Board would like to thank the divers that were interviewed for their candidness. We also wish to thank the O&M Division for all their work in organizing the meetings site visits and providing us with the material and information needed to conduct this review.

Sincerely,


James R. Stewart


Anthony R. Traina


Frank C. McGinnis


William F. Aichele

cc: Teresa Sutliff

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The panel recommends that DWR implement the following recommendations. These recommendations are further detailed in the remainder of this report:

1. Appoint a full-time Dive Coordinator whose qualifications include a thorough understanding of the operation of the State Water Project and minimum of 5 years diving and 5 years experience within the SWP.
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- The Operations Chief for each field division shall review all dive requests to make sure the operational mode needed for the dive can be complied with.
- The approved copies of the dive request shall be in the possession of the dive coordinator prior to commencement of any dives.
- The Dive Coordinator shall handle all requests for clearances, lock out/tag out procedures, and flow requirements for all dives.
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- As previously recommended, all plant and water operators shall be made familiar with the diving policy and diving operations at their facilities and complete refresher training on a regular basis.

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- All dive crew members, including tenders, must be qualified divers. If DWR is to maintain an in-house dive team, the qualifications and roles and responsibilities for all dive team members (entry level through dive supervisor) will have to be developed. The panel recommends following industry standards such as the ADC consensus standards.
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- Each dive will have the following form or report completed and signed by the appropriate persons:
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 - Clearance or Lock out/Tag out
 - Job Safety Analysis
 - Diver Log (Use standard dive logs)
 - Final Dive Report
- All current DWR forms shall be reviewed and updated as necessary.

Contract Diving

- All diving contractors shall have a California State Contractors license.
- All diving will be in accordance with the ADCI Consensus Standards.
- The contractor must also carry insurances as per DWR's specifications.
- The diving coordinator shall conduct a safety audit prior to the award of the contract. A suggested audit format has been provided in a separate transmittal.

Lockout/Tagout Procedures

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- Locks are to be used in all lockout tagout procedures.
- The diving coordinator or dive supervisor will maintain control of the keys of the tagout locks for the duration of the diving operation.

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Vehicle Removal

- Tow companies removing vehicles from the canal must have a DWR representative onsite and must abide by the DWR dive policy.

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All service and repair work shall be performed by factory authorized service representatives and be tested prior to going back into service.

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Certifications

The DWR Dive Coordinator should keep a record for each diver. This record should have the current dive certification, current diving physical, first aid, CPR, AED and oxygen provider certifications. Copies of any other required certifications and records of training shall also be maintained.

Training

If DWR is to keep in-house diving for the purpose of inspection only, the following minimum requirements shall be met for each diver:

Entry level requirements and certification

1. Pass medical diving examination
2. Pass DWR swim test
3. Basic SCUBA course
4. Basic Surface Supplied Diving
5. CPR, First Aid, AED, oxygen provider and any other required classes

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For all divers on the Dive Team

1. Each diver should make a minimum of one dive per month working to stay current.
2. Complete annual refresher training for CPR, First Aid, and Oxygen Provider and additional as needed.
3. Have diving safety meetings once a month and weekly tailgate safety meetings (not necessarily diving related).

If DWR is to develop in-house dive capabilities to perform all potential work, commercial dive training by a professional dive school would be required.