



[Form 2 (to be reported to Committee on Countermeasures for Contaminated Water Treatment and to be disclosed to public)]

Technology Information	
Area	5 (Select the number from "Areas of Technologies Requested")
Title	<b>5A Use a tunnel (rather than boreholes) to drain the porous ground upslope of the reactor buildings</b>
Submitted by	eco-atomic consultants Ltd
<b>1. Overview of Technologies (features, specification, functions, owners, etc.)</b>  The current intention to use boreholes to control the groundwater level around the reactor buildings appears feasible but it may have two potential drawbacks: i) That the boreholes may not deal effectively with the flow of any water through fracture in the rock; ii) That the borehole work and operation involves exposure of operators to the ambient radiation dose on the Fukushima Daichii site close to the reactor buildings.  An alternative approach could be to dig a horizontal tunnel running north-south and located just to the west of the reactor buildings. If the tunnel were dug along the base of the porous rock band it would allow complete draining of the groundwater just upslope of the reactor buildings. The potential advantages of this option are: i) It gives complete visibility of the geology of the porous rock layer in the vicinity of the reactor buildings; ii) It guarantees complete drainage of the groundwater regardless of faults in the rock structure; iii) It allows the work to be done away from the contamination on the surface of the site and the direct radiation shine from the reactor buildings iv) The tunnel could later provide a shielded access route into the basements of the reactor buildings for core removal work.	

**2. Notes (Please provide following information if possible.)**

- *Technology readiness level (including cases of application, not limited to nuclear industry, time line for application)*

Tunnelling in such porous rock is a well-developed and well understood process. For a tunnel of, say, 2m diameter tunnelling rates of 1 to 10 m per day are common so the process could be complete in several months. Radiation exposure to the workers would be minimal.

- *Challenges*

The control of the groundwater level will be critical as the tunnelling approaches the vicinity of the reactor buildings if outward migration of radioactivity is to be avoided. It may be necessary to operate the tunnel partially flooded to maintain the groundwater level stable and maintain control of contamination in the reactor building basements.

- *Others (referential information on patent if any)*

**US Army Corps of Engineers, Engineer Manuals - Engineering and Design - Tunnels and Shafts in Rock**

(available at: [http://140.194.76.129/publications/eng-manuals/EM\\_1110-2-2901/toc.htm](http://140.194.76.129/publications/eng-manuals/EM_1110-2-2901/toc.htm) accessed 23/10/2013)