SUBSURFACE ANALYSIS USING ELECTRICAL RESISTIVITY TOMOGRAPHY (ERT) TO IDENTIFY CHANGES IN THE HYDRAULIC GRADIENT OF AN ALLUVIAL AQUIFER AT MONTANDON, PA

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Electrical Resistivity Tomography (ERT) methods were used to determine the impact on groundwater hydrology due the placement of a slurry wall at Montandon, PA. ERT surveys used 1) 0.5-m spacing and 2) roll-along technique with 1-m spacing both in standard dipole-dipole array. The surveys are directed to the exploration of how the slurry wall is impacting the groundwater field with high-resolution due to perpendicular S-N and E-W oriented transects. The perpendicular survey performed 3 meters south of the center of the slurry wall, intersects at 113 meters of the S-N transect. With this spacing, the survey has identified the low resistivity slurry wall and its connection to bedrock. The change of the hydraulic gradients on each side of the slurry wall is a direct implication of the wall. Four hydraulic discharges were calculated using horizontal and vertical hydrologic conductivity (K) values. Due to the fractured limestone, it allowed for horizontal flow beneath the slurry wall between the alluvial formation and the bedrock. The 195 roll-along survey was performed at 5 m west of the slurry wall with 1-m spacing. With this resolution, the following results were determined: 1) A discontinuity within the electrical resistivity field confirming the heterogeneity of the alluvial aquifer; 2) the high saturation and the increase of the total head on the side where water is impeded by the slurry wall is changing the hydraulic gradient of the site. The ERT has successfully visualized these zones and enabled the hydraulic discharges to be calculated for areas of interest within the survey. The study has quantified the impact of the slurry wall on the hydraulic gradient and theorized the probability of reverse groundwater hydrology.