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MEMO

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Carlo San Giovanni
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From:
Robert Porsche

Date:
21 July 2004

ARCADIS Project No.:
NY001348.0204.00003

Subject:
Technical Advantage of Calpine Recharge Scenario.

During our call with Mr. Steve Scharf of the NYSDEC on July 16, 2004, he indicated that the NYSDEC well permit for well GP-3, issued in 1973, requires that all water pumped by the well must be recharged to the aquifer. Currently, this is accomplished after treatment by recharging water from the GP1/3 system to the South and West Basins. Recently, NGC began negotiating with Calpine to provide approximately 1,000 gpm of groundwater for consumptive use in exchange for electric power. As discussed in our July 16th call, the NYSDEC has the authority to alter the permit's requirement to recharge the GP1/3 remedial system water if it can be demonstrated that there is a technical advantage to diverting the water elsewhere.

In response to the call with Steve Scharf ARCADIS reviewed the output from past modeling simulations conducted to assess the impact of changes to the distribution of recharge associated with the Northrop Grumman Corporation (NGC) GP1/3 and ONCT Remedial Systems.

Review of past modeling simulations indicates that there is no detrimental impact to the capture zones/hydraulic barrier produced by the operation of the GP1/3 and ONCT Remedial Systems when treated water, typically recharged through the West Basins (and some to the South Basins) is diverted to Calpine. In fact, the diversion of recharge results in a benefit to the Remedial Systems, as described below:

- The West Basins lie within the capture zone associated with the Remedial Systems. As such, a portion of the water recharged to the aquifer via these basins is eventually re-extracted by the

Remedial Systems (GP1/3 and ONCT). Diversion of water from the West Basins to Calpine lowers the hydraulic head along the west side of the NGC site. The lowered hydraulic head, coupled with the continuation of pumping at "pre-diversion" rates (total remedial system pumping equal to current pumping rates) results in an expanded capture zone as the wells continue to withdraw the same quantity of water from the aquifer, without the source of water provided by the West Basins. The expanded capture zone enhances achievement of the Remedial Systems goal of maintaining full containment of the on-site TVOC-impacted groundwater plume.

- To provide the water requested by Calpine, NGC will be increasing the current GP1/3 system ROD-required extraction rate by approximately 500 gpm. This planned increase in production will also result in an expansion of the capture zone/hydraulic barrier and increase the rate of contaminant mass removal.

- The diversion of water from the West Basins to Calpine also simplifies the operation of the GP1/3 Remedial System. A simpler system is less prone to failure, and requires less maintenance.

The diversion of aquifer recharge from the West Basins to Calpine does not adversely affect the ability of the Remedial Systems to achieve their design goals and is in fact beneficial in that system operation is simplified, and system effectiveness (capture zone size) is enhanced.

In addition to the benefits described above, which directly affect the performance of the GP1/3 and ONCT Remedial Systems, the diversion of water from the GP1/3 system to Calpine results in the secondary benefit of preserving available water supply resources. If Calpine were forced to seek the water necessary for plant operations from another source, whether it were from a nearby water purveyor or through the installation and operation of their own production well, groundwater resources would be subjected to an additional 1,000 gpm withdrawal, which is otherwise available for use by the surrounding communities.

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MEMO

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Northrop Grumman Corporation

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Doug Smolensky

From:
Robert Porsche

Date:
8 July 2004

ARCADIS Project No.:
NY001348.0204.00003

Subject:
Calpine Water Supply Modeling

This memo has been prepared to outline the results of the modeling conducted to assess the ability of the Northrop Grumman Corporation (NGC) to supply water to the Calpine Plant without adversely affecting the hydraulic barrier created along NGC site's southern boundary through the operation of the GP1/3 and ONCT 1, 2, and 3 remedial systems.

Purpose:

Northrop Grumman has requested this modeling effort to assess their ability to provide the Calpine Plant with between 600 and 1,000 gpm of treated groundwater for consumptive use. Previous modeling efforts have assessed the effect of a partial or complete failure of the GP1/3 system. As such, previous modeling work assumed that both production and recharge associated with the GP1/3 system would be lost.

Procedure:

This assessment was completed by evaluating the movement of forward tracked particles under the two pumping configurations defined below to determine if any escape capture by the GP1/3 and ONCT remedial systems.

1. In accordance with the current system configuration, the withdrawal of water from the GP1/3 system was maintained, and a portion of their discharge was diverted to the Calpine plant rather than recharged to the groundwater system through the South Basins.

2. It is assumed a failure of the GP1/3 system has occurred. The water normally produced by the GP1/3 system will be "made up" by increasing the production rates of the ONCT 1, 2, and 3 wells from a total of 2,300 gpm to 3,400 gpm (it is assumed that ONCT-1 has a peak production capacity of 1,400 gpm, and that the peak capacity of ONCT-2 and 3 is 1,200 gpm, each).

The table below shows the distribution of groundwater production and recharge associated with the two scenarios described above:

Source/Destination ID	**Pumping/Recharge Rate (gpm)**	
	Scenario 1	**Scenario 2**
GP-1	1,075	0
GP-3	425	0
ONCT-1	1,000	1,400
ONCT-2	600	900
ONCT-3	700	1,100
Total Production	**3,800**	**3,400**
West Basin	0	0
South Basins	2,686*	2,298*
Calpine	1,000	1,000

* reduced in accordance with previous modeling to reflect 3% loss from system piping.

Forward particle tracking was conducted to determine if the capture zone associated with these pumping and recharge scenarios differed significantly from previous capture zone assessment modeling.

Results

An assessment of the forward tracked particle paths indicate that under both scenarios the hydraulic barrier produced by the onsite remedial system(s), and their resultant capture zones, maintain containment of the onsite portion of the VOC-impacted groundwater plume. The attached Figures 1-14 show that for each layer, all particles are contained by the onsite remedial systems.

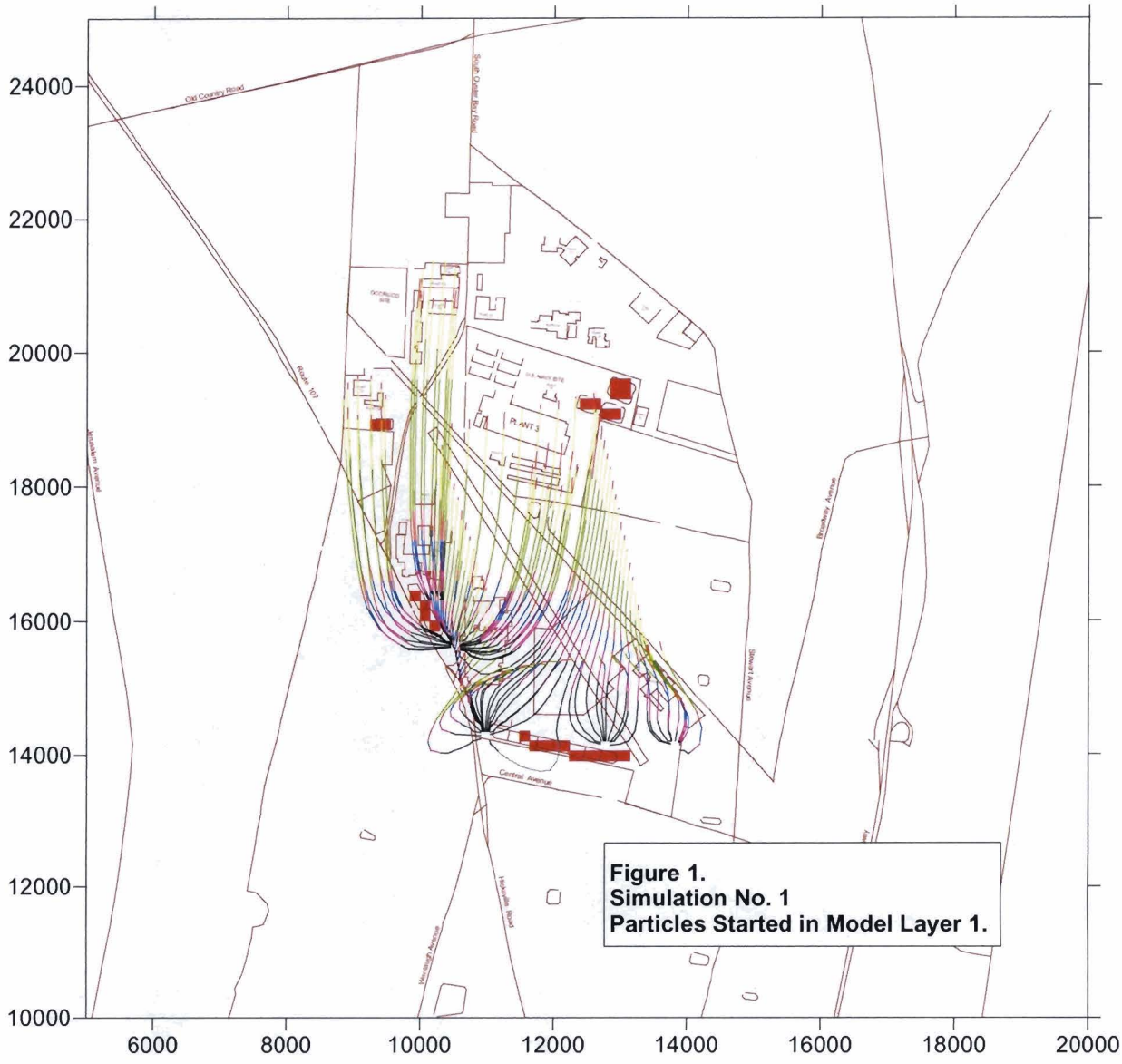


Figure 1.
Simulation No. 1
Particles Started in Model Layer 1.

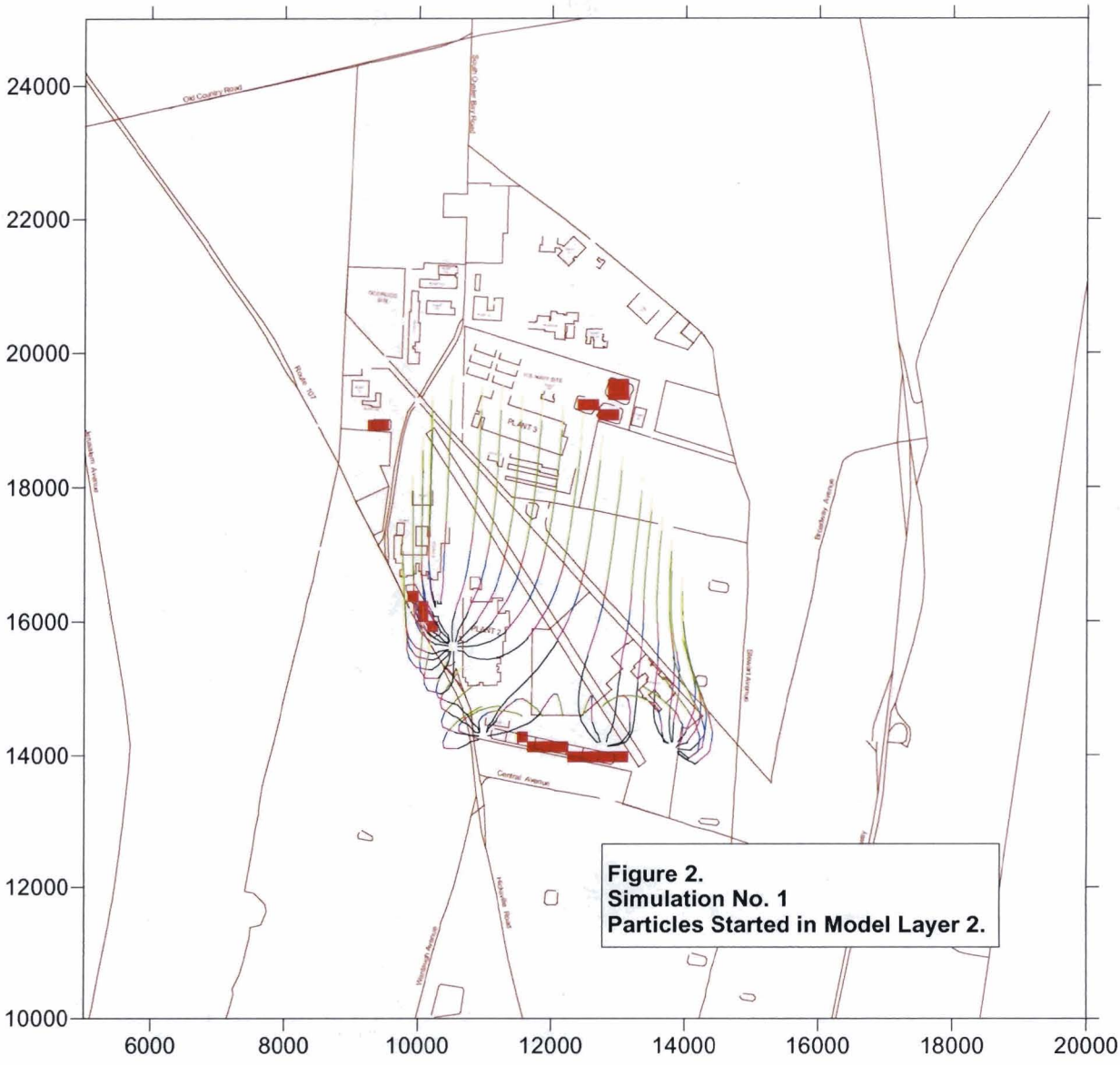


Figure 2.
Simulation No. 1
Particles Started in Model Layer 2.

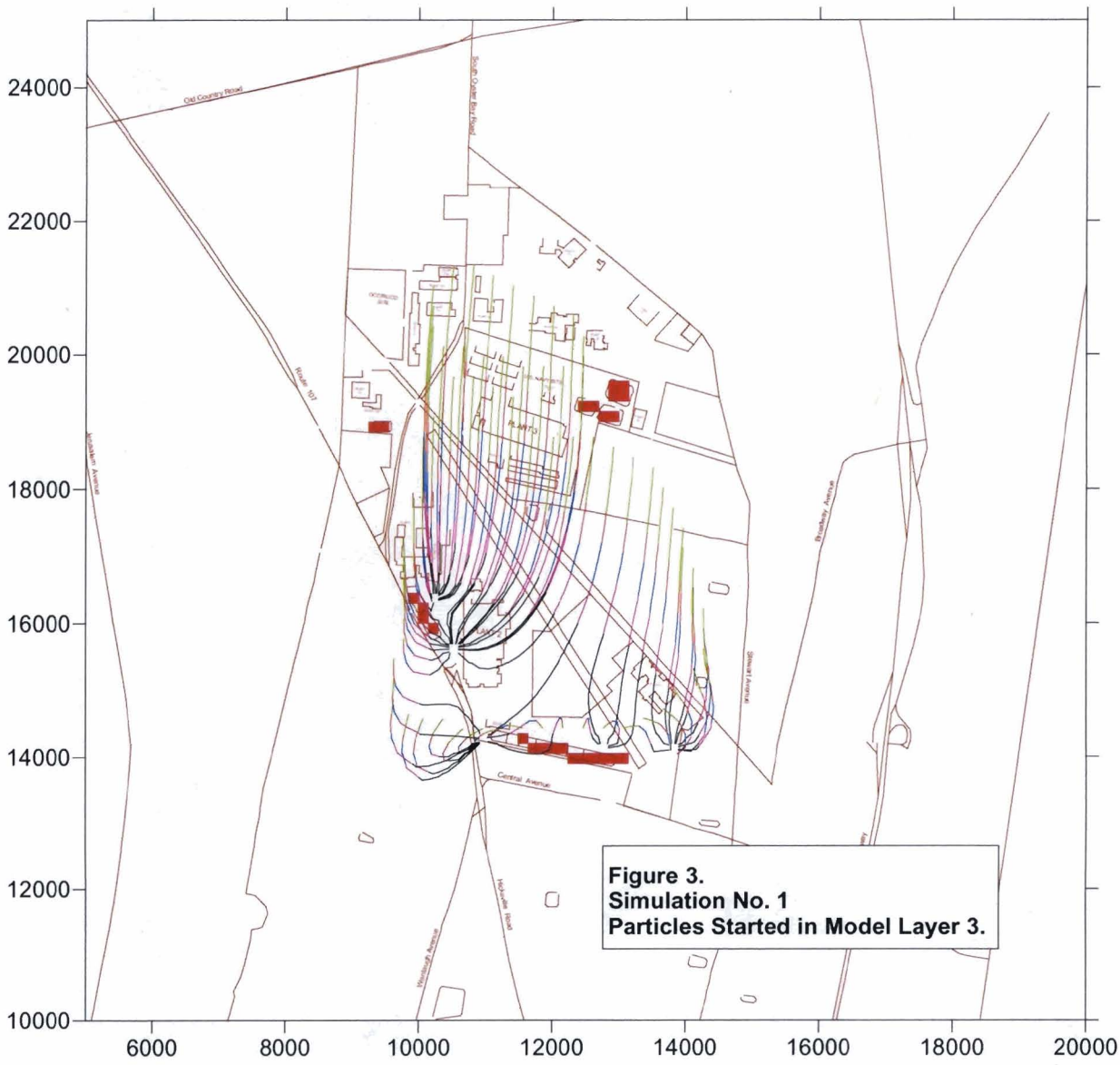


Figure 3.
Simulation No. 1
Particles Started in Model Layer 3.

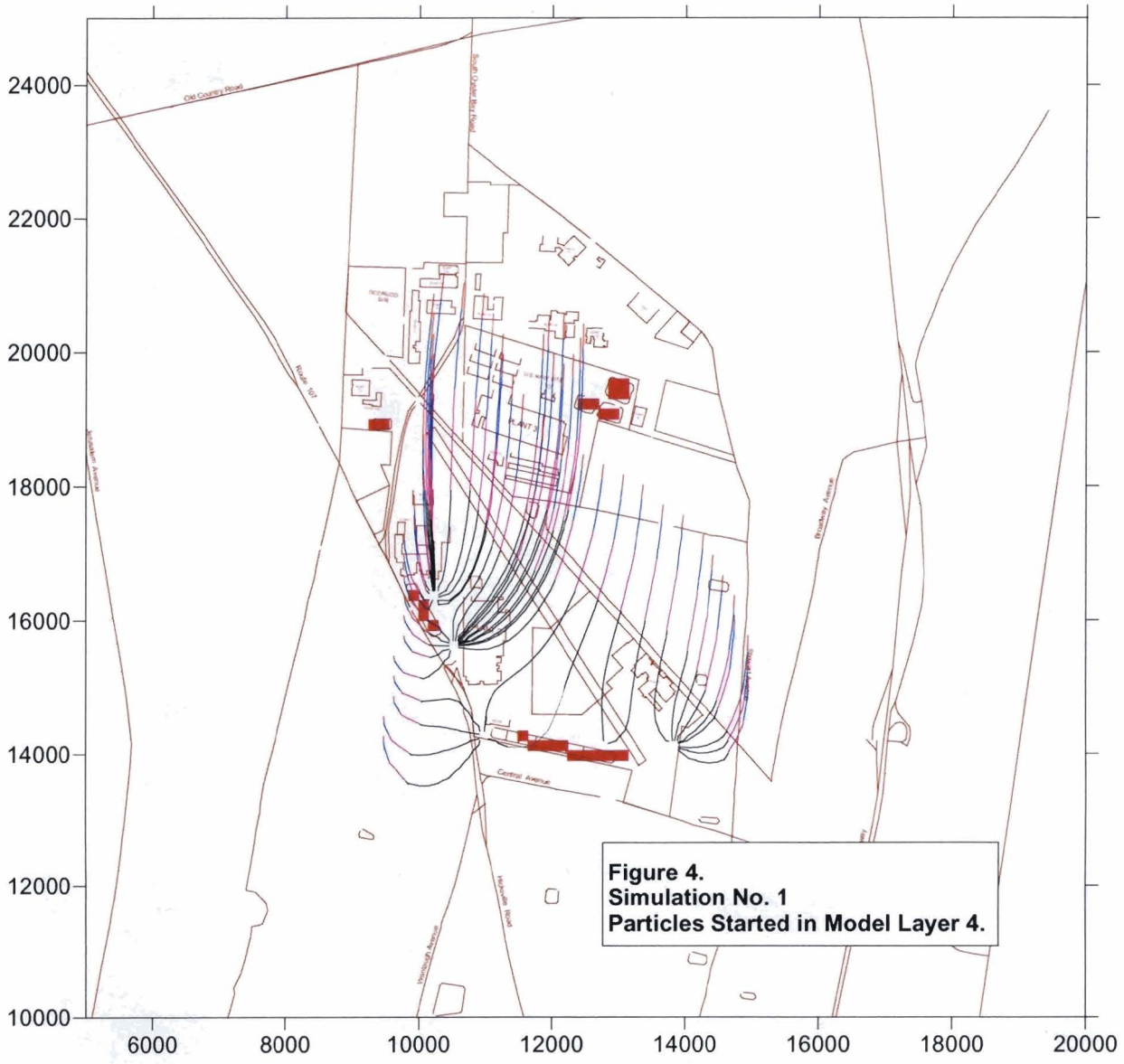


Figure 4.
Simulation No. 1
Particles Started in Model Layer 4.

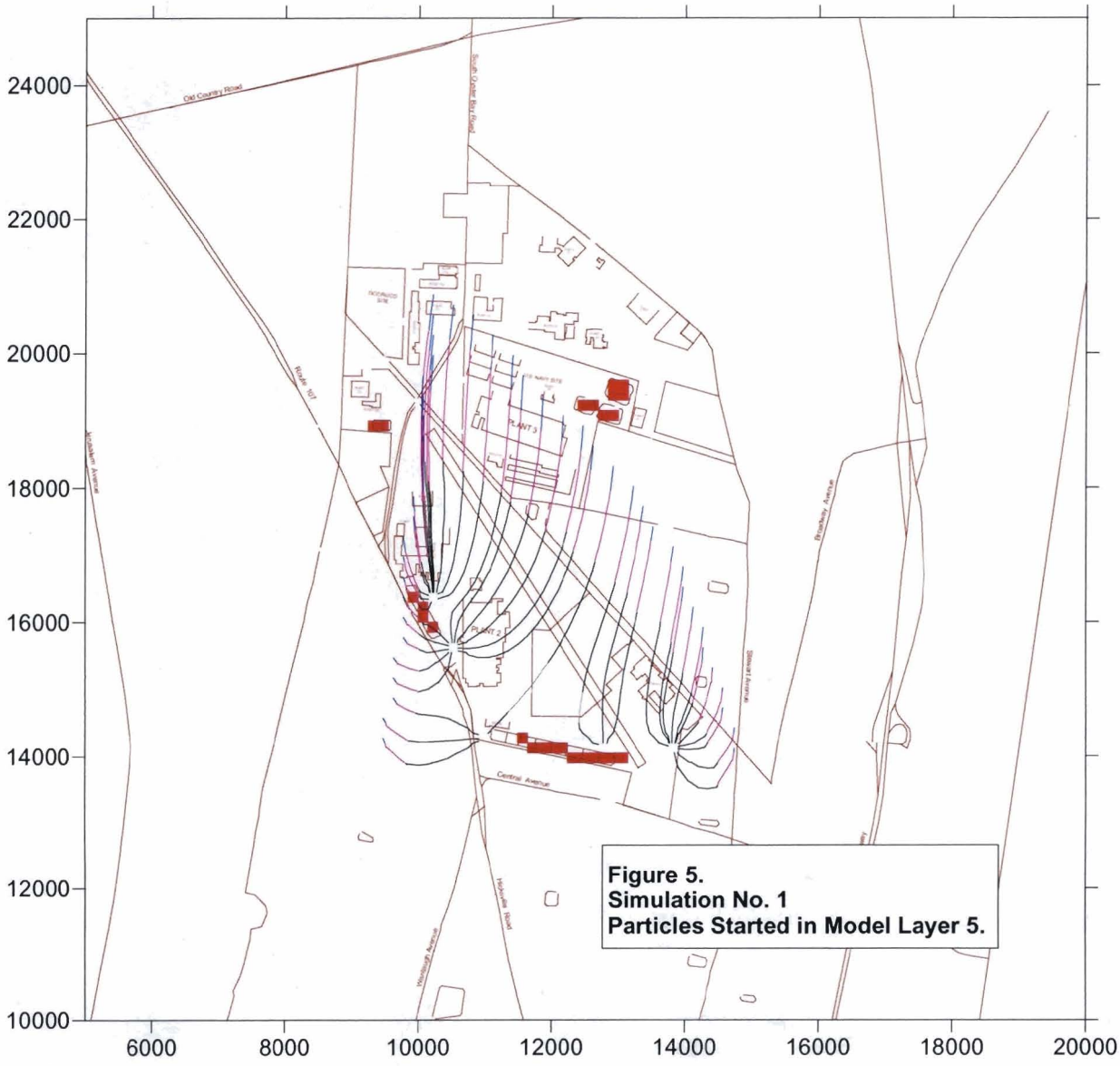
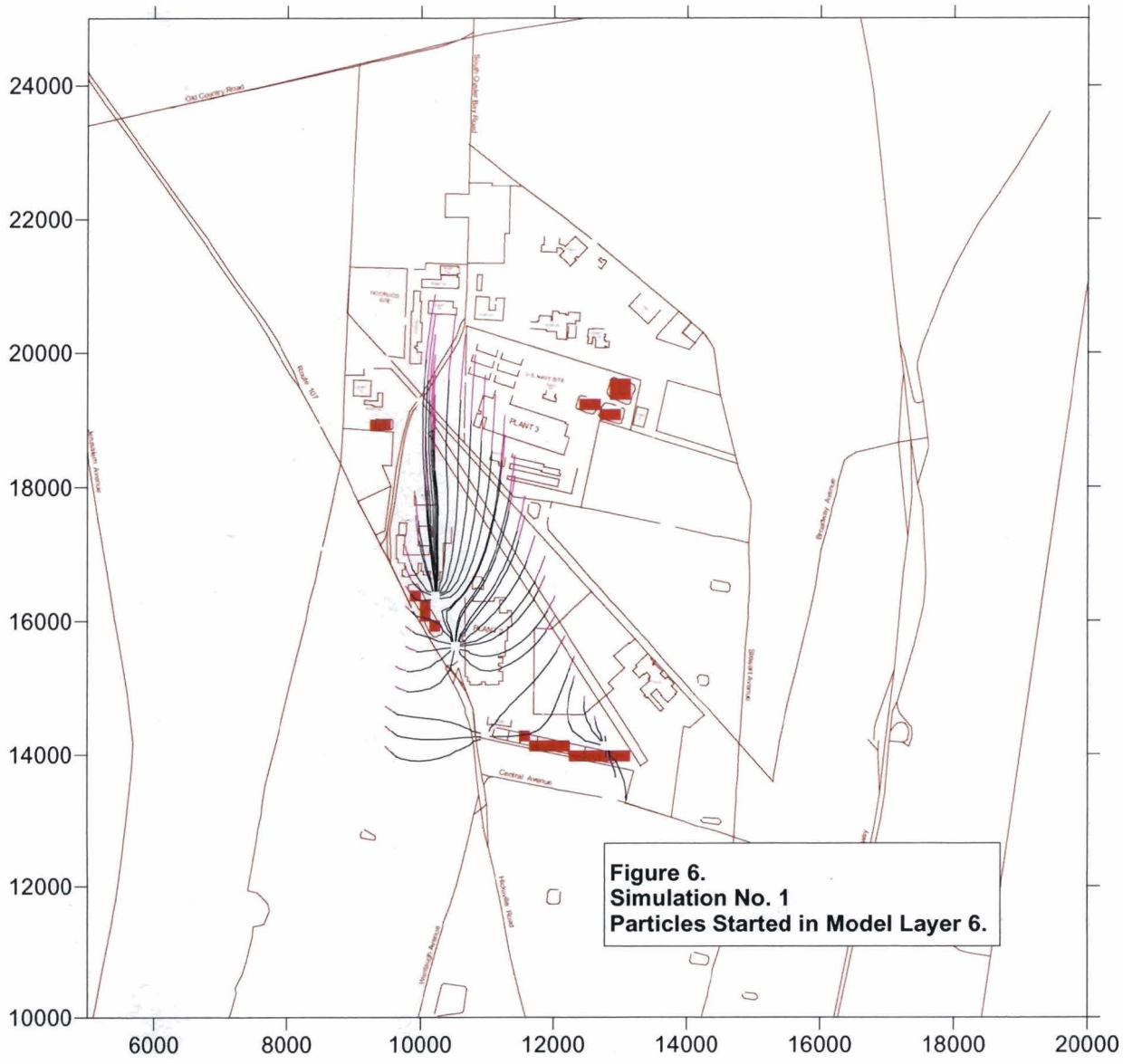


Figure 5.
Simulation No. 1
Particles Started in Model Layer 5.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22000
20000
18000
16000
14000
12000
10000
6000
8000
10000
12000
14000
16000
18000
20000
Old Country Road
South Oyster Bay Road
Route 107
PLANT 3
Central Avenue
Hicksville Road
Broadway Avenue
Jerusalem Avenue
Woodbury Road
Figure 6.
Simulation No. 1
Particles Started in Model Layer 6.

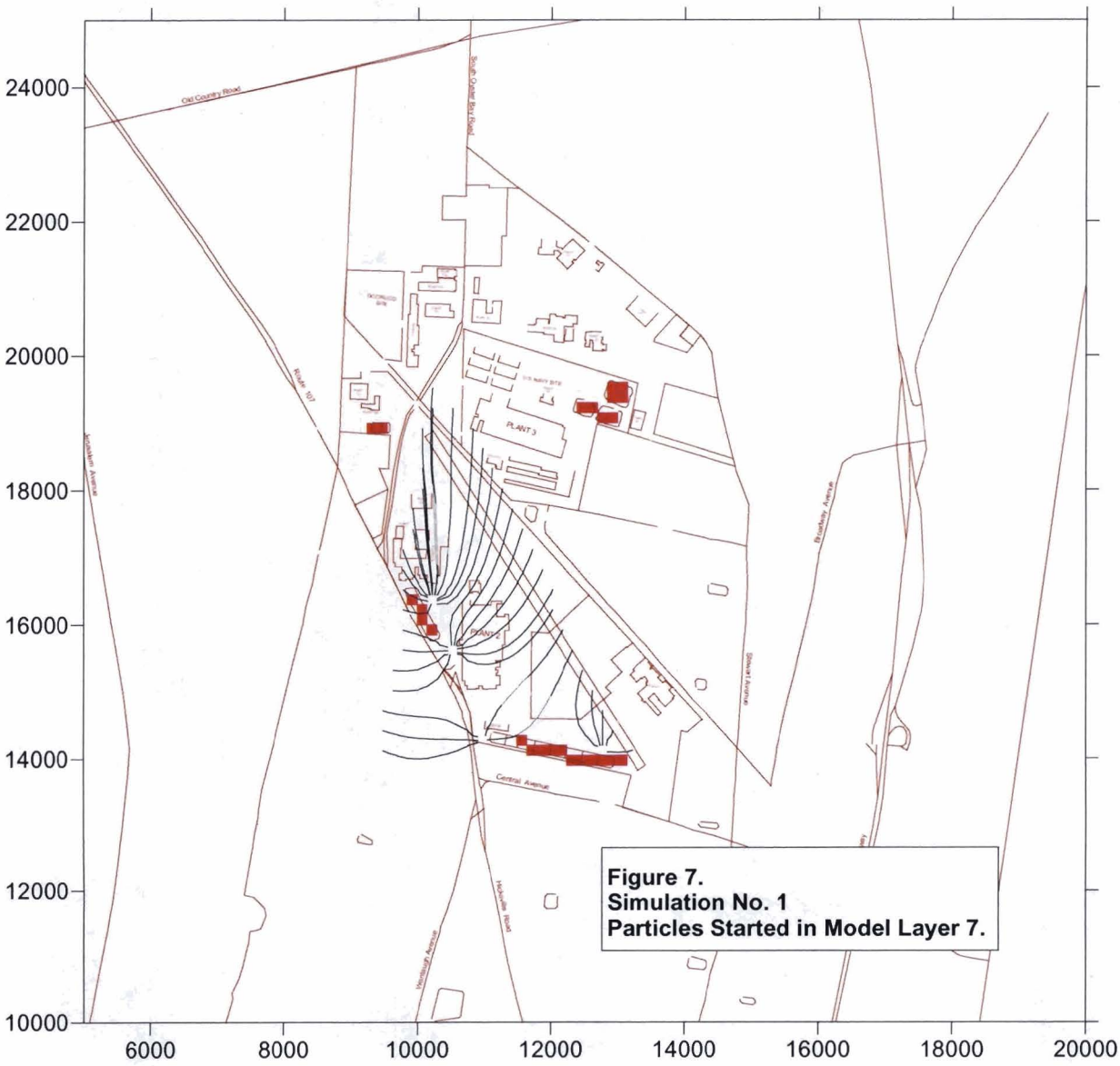

Figure 7.
Simulation No. 1
Particles Started in Model Layer 7.

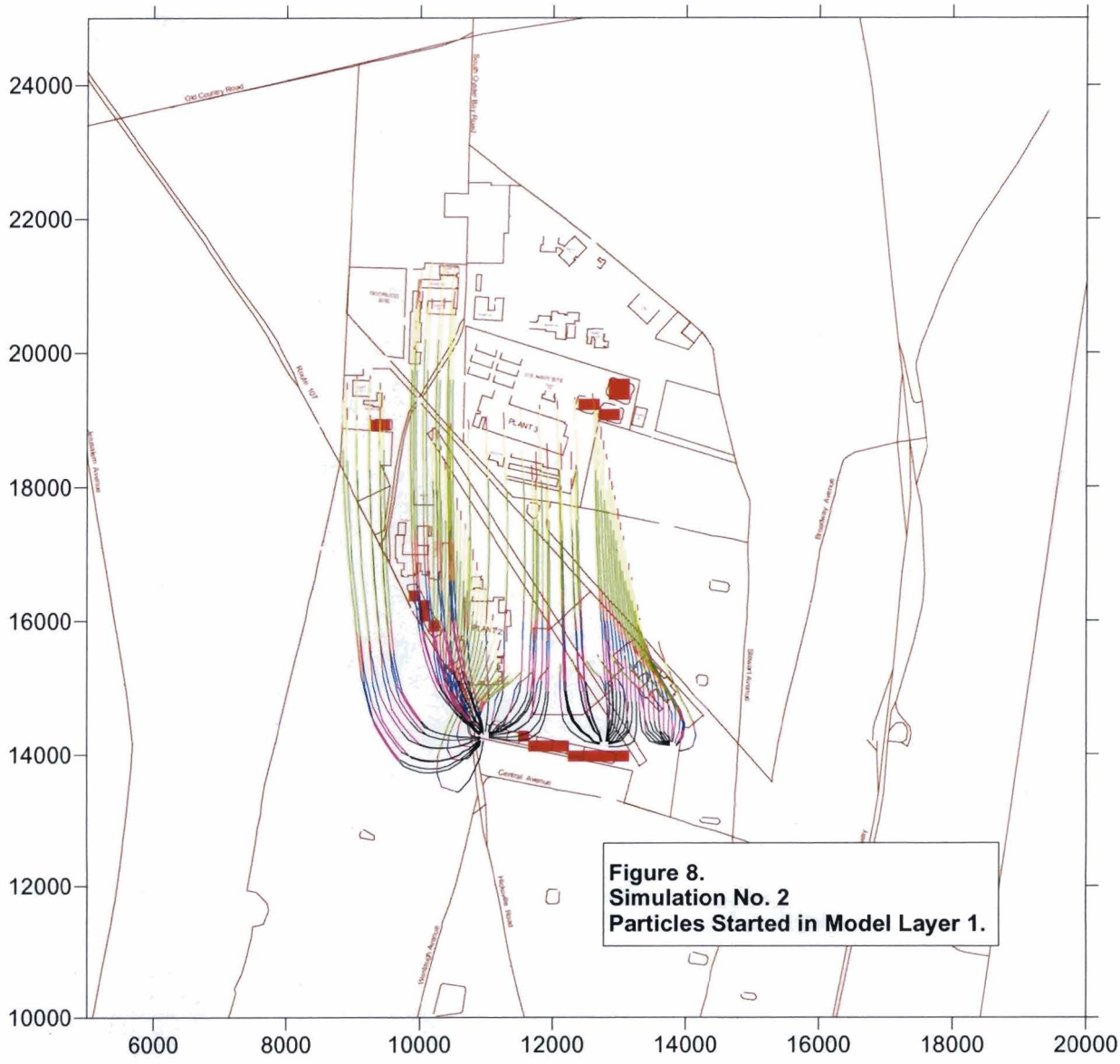

Figure 8.
Simulation No. 2
Particles Started in Model Layer 1.

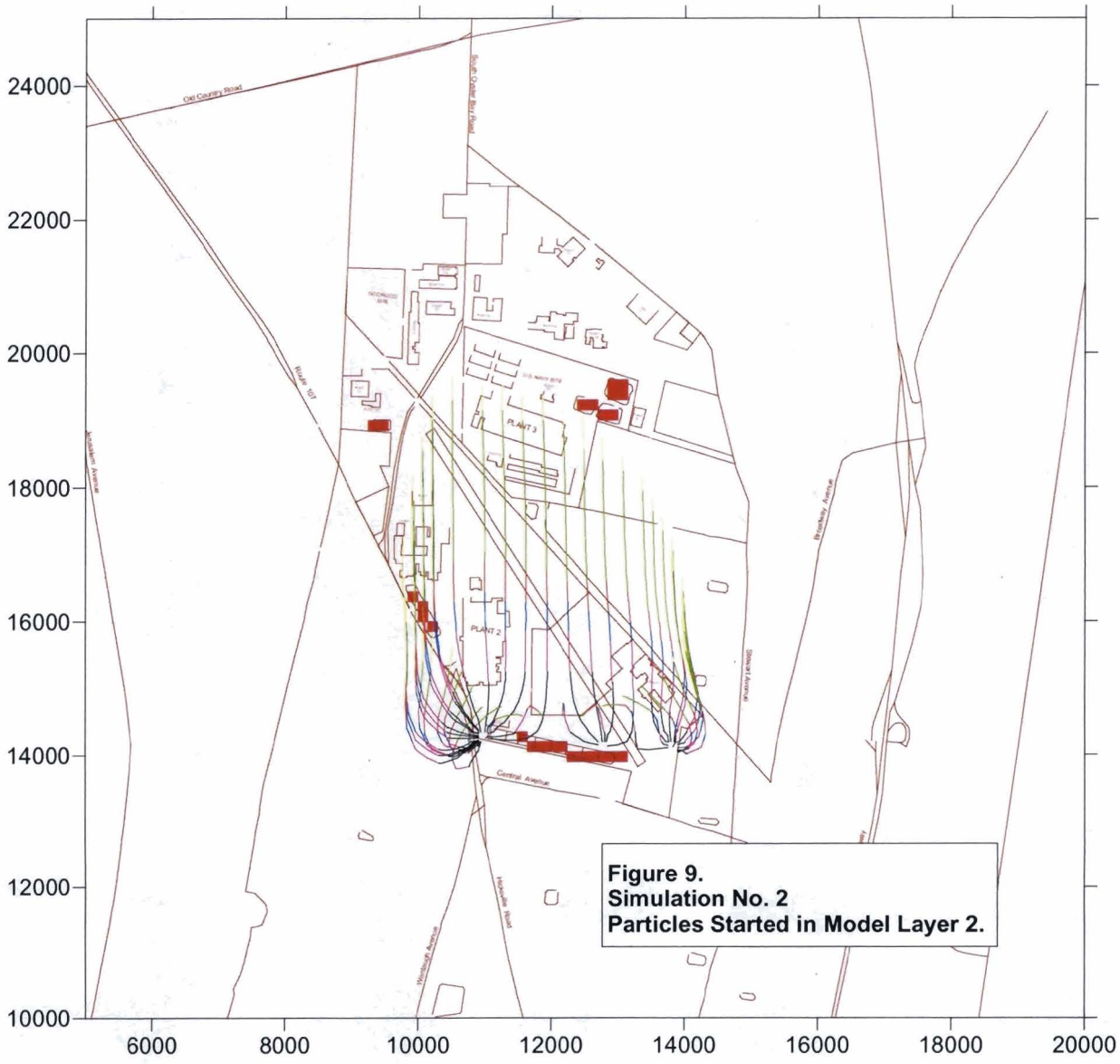

Figure 9.
Simulation No. 2
Particles Started in Model Layer 2.

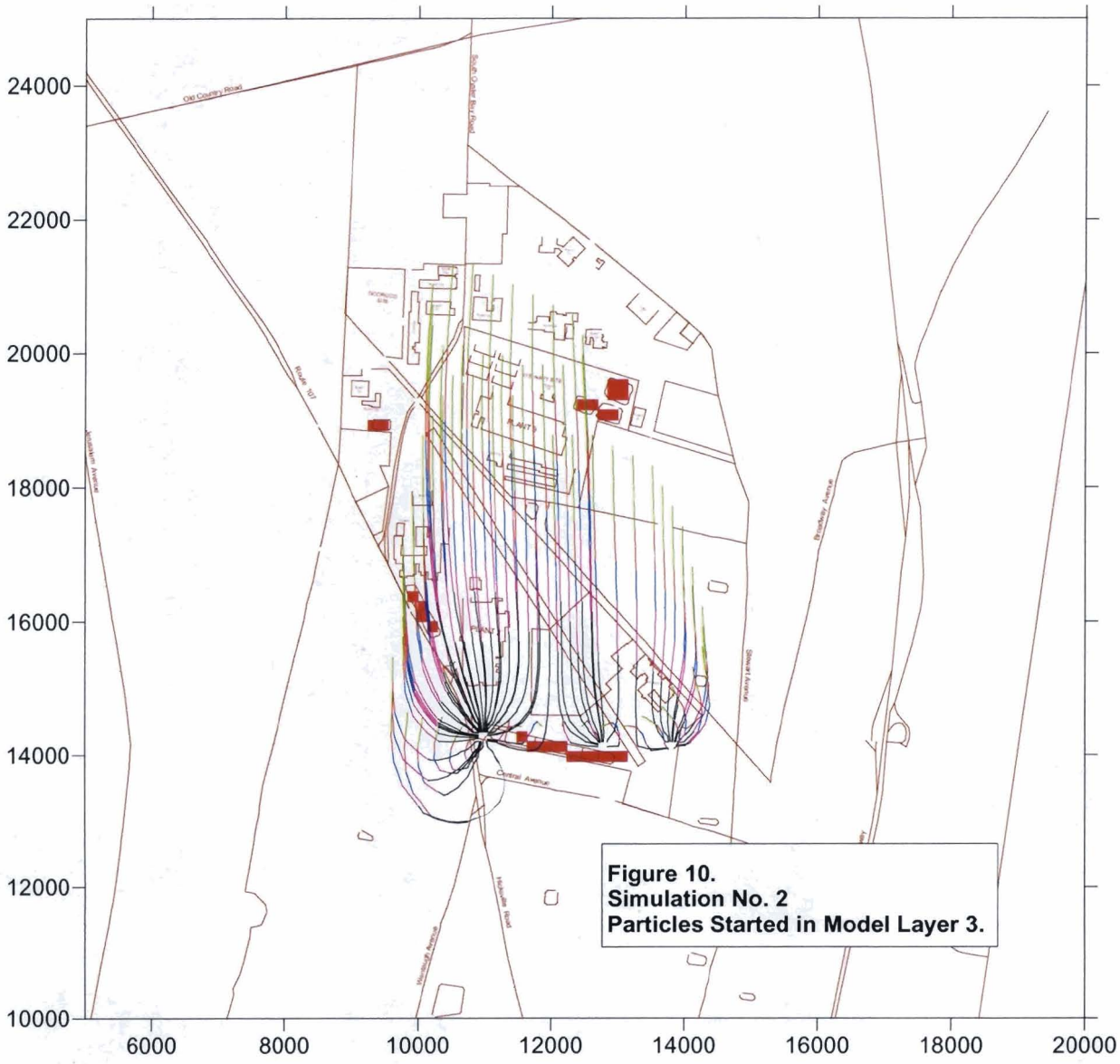

Figure 10.
Simulation No. 2
Particles Started in Model Layer 3.

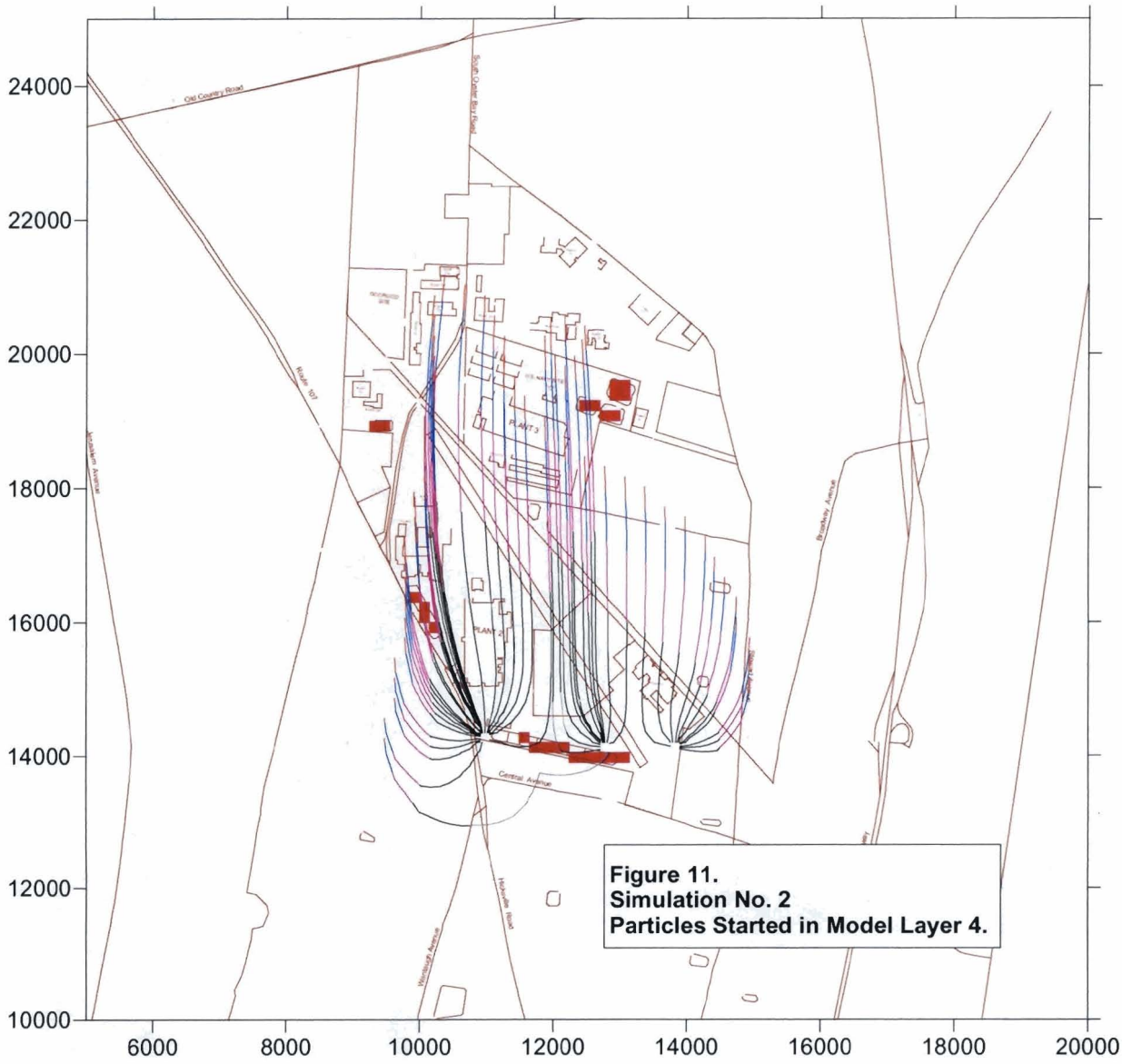

Figure 11.
Simulation No. 2
Particles Started in Model Layer 4.

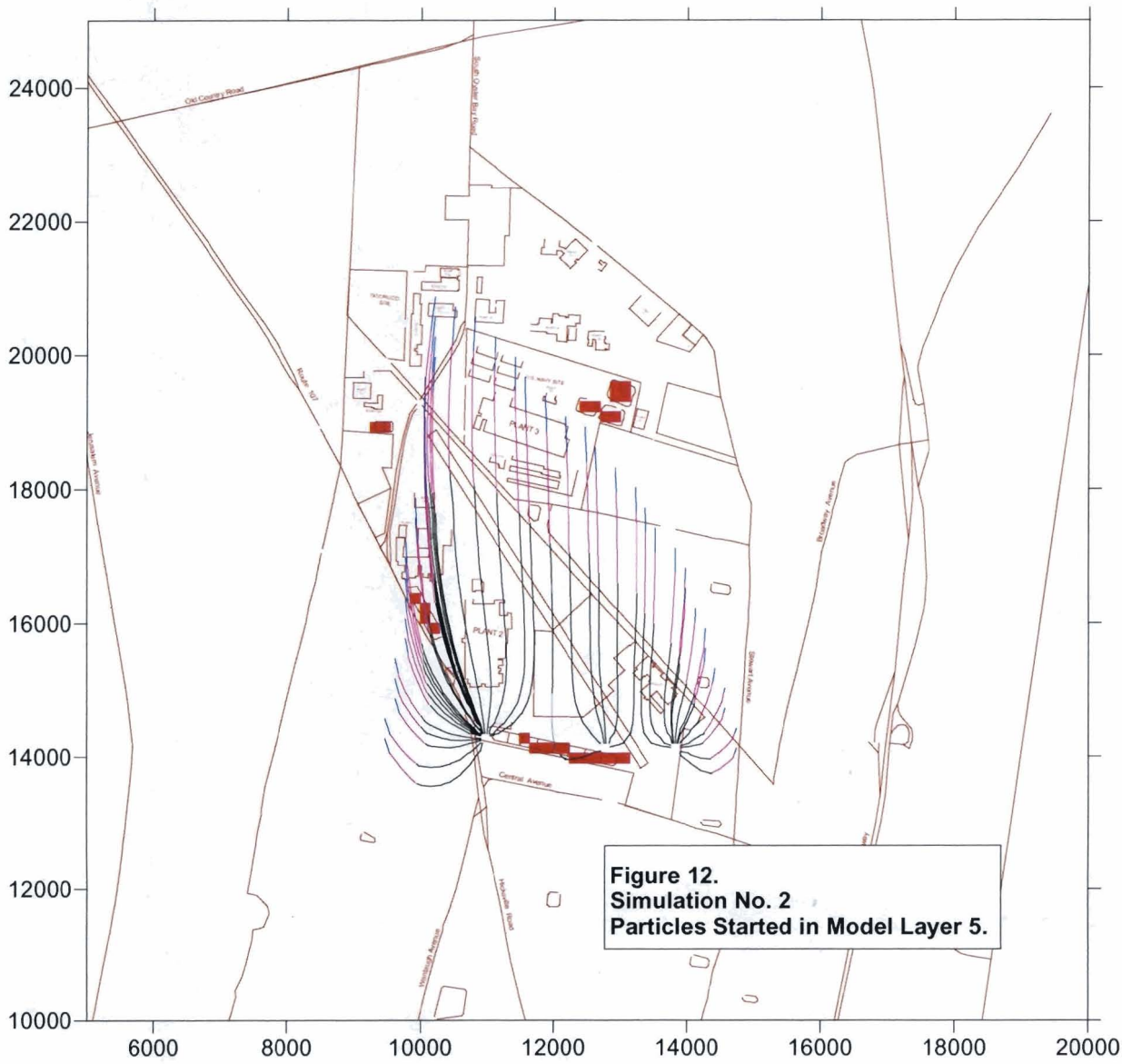

Figure 12.
Simulation No. 2
Particles Started in Model Layer 5.

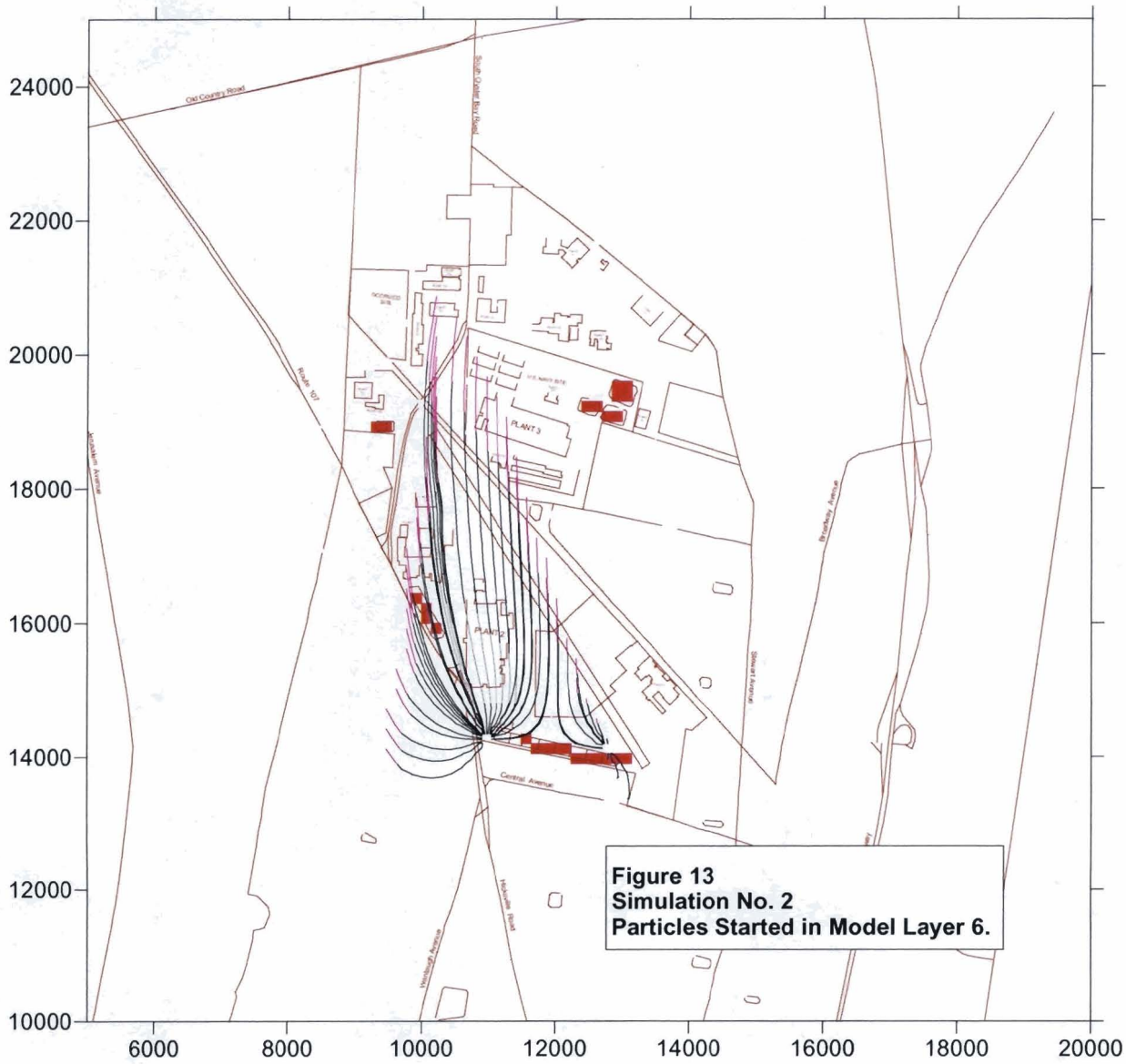

Figure 13
Simulation No. 2
Particles Started in Model Layer 6.

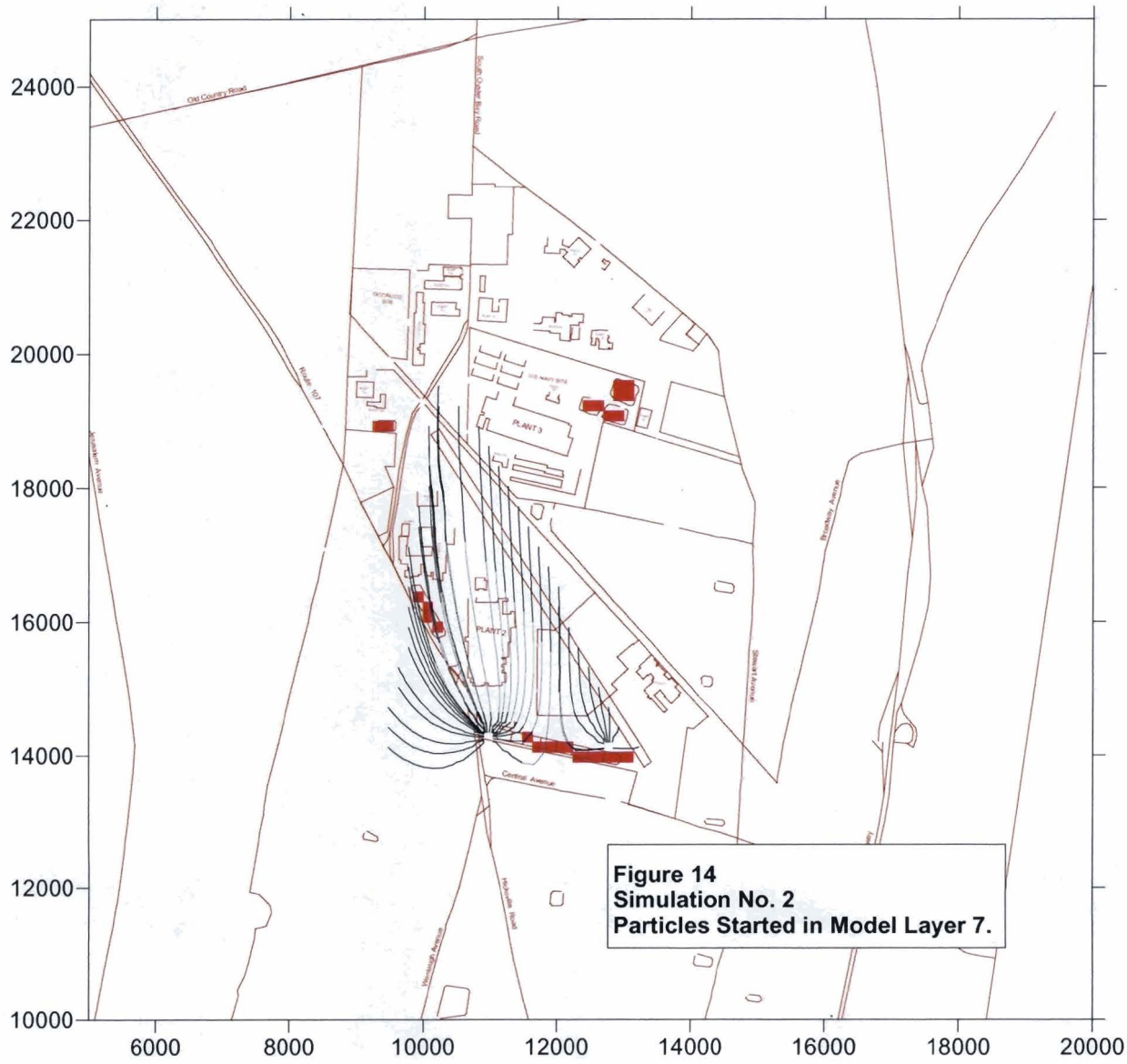

Figure 14
Simulation No. 2
Particles Started in Model Layer 7.